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CLINICAL MANUALS
FOR
PRACTITIONERS AND STUDENTS
OF MEDICINE.



*Fig 1

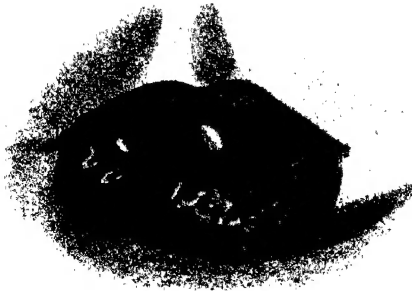


Fig 2.

ULCERATIVE STOMATITIS.

THE SURGICAL DISEASES

OF

CHILDREN.

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To
MY FATHER,
WITH AFFECTION AND RESPECT,
I DEDICATE THIS BOOK.

P R E F A C E.

It is hoped that, in the endeavour to compress within an allotted number of pages an account of the entire subject of the surgery of infancy and childhood, theory has not been unduly sacrificed to practice, nor clearness to condensation.

Claim is not made that this volume be considered an exhaustive treatise ; its design is that of a "complete monograph" in a series of clinical manuals for practitioners and students.

Thanks are tendered to Dr. Gee for permission to use sketches from the portfolio of the Hospital for Sick Children, for Figs. 16 and 17 ; to Mr. Thomas Smith for Fig. 22 ; to Dr. R. Lee for Fig. 4 ; and to Dr. Steavenson for Fig. 19 ; to Mr. Hutchinson for Fig. 5 ; and to a former House Physician, Dr. John Thomson, for making the drawing from which the chromo-lithograph, Plate I. Fig. 1, was executed.

In the matter of development, reference has been

made to Dalton's "Human Physiology," and to the ninth edition of Quain's "Anatomy."

The author begs to express his thanks to the artists for the care which they have given to the illustrations, and to his friend and colleague, Mr. Bernard Pitts, for supervising the proof-sheets of the first edition.

London, March, 1889.

CONTENTS.

CHAPTER	PAGE
I.—INTRODUCTORY REMARKS	1
II.—“CROUP,” DIPHTHERIA, AND LARYNGITIS.	14
III.—TRACHEOTOMY AND THYROTOMY	39
IV.—CERTAIN DIATHESES	58
V.—SYPHILIS	74
VI.—RACHITIC DEFORMITIES	86
VII.—ENLARGEMENT OF LYMPHATIC GLANDS	103
VIII.—TUMOURS	121
IX.—NÆVI, WARTS, BOILS, KELOID, ETC.	135
X.—HYDRO-THORAX AND EMPYEMA	146
XI.—BURNS AND SCALDS	157
XII.—INFANTILE PARALYSIS — PSEUDO - HYPERTROPHIC PARALYSIS — TETANY — SPASTIC PARALYSIS — NEURO-MIMESIS—SPORADIC CRETINISM	162
XIII.—CERTAIN MALFORMATIONS IN HEAD AND NECK	175
XIV.—THE MOUTH, PHARYNX, NOSE, AND EAR	187
XV.—HARE-LIP	225
XVI.—CLEFT PALATE	232
XVII.—FOREIGN BODY IN WIND-PIPE—SCALD OF FAUCES	238
XVIII.—SPINA BIFIDA	243
XIX.—SPINAL CARIES	248
XX.—THE GENITO-URINARY TRACT	273
XXI.—THE RECTUM	326

X *THE SURGICAL DISEASES OF CHILDREN.*

CHAPTER	PAGE
XXII.—INTESTINAL OBSTRUCTION	335
XXIII.—HYDROCELE AND DISEASES OF THE TESTIS	353
XXIV.—HERNIA	363
XXV.—LATERAL CURVATURE OF THE SPINE	375
XXVI.—PERIOSTEUM AND BONE	387
XXVII.—FRACTURES	399
XXVIII.—DISLOCATIONS	421
XXIX.—HIP-JOINT DISEASE	426
XXX.—DISEASE OF THE SACRO-ILIAC JOINT	458
XXXI.—DISEASE OF THE KNEE JOINT	461
XXXII.—DISEASE OF THE SHOULDER AND ELBOW JOINTS, ETC.	486
XXXIII.—DISEASE OF THE ANKLE JOINT	499
XXXIV.—DEFORMITIES OF THE FOOT	509
XXXV.—DISEASES OF THE FOOT	529
INDEX	537

LIST OF CHROMO-LITHOGRAPHS.

PLATE

I.—STRUMOUS DACTYLITIS, AND ULCERATIVE STOMATITIS	<i>Frontispiece.</i>
II.—EXTREME RICKETS	<i>To face p. 70</i>
III.—CONDYLOMATA, AND HIATUS OF BLADDER	<i>To face p. 78</i>
IV.—EPULIS, AND MOLLUSCUM CONTAGIOSUM	<i>To face p. 122</i>

THE SURGICAL DISEASES OF CHILDREN.

CHAPTER I.

INTRODUCTORY REMARKS.

DR. WEST makes the observation, that though the infant cannot talk it has a language of its own, a language of signs ; and that when little children are ill they will express their real feelings, whether by words or signs, to none but those whom they regard as friends.

To secure the confidence of little children much tact may be demanded. The surgeon should not go straight to the patient and begin asking questions bearing on the case. Generally it is advisable that he take no notice of him for some little time after entering the room, endeavouring rather to allay suspicions by talking in a quiet and kindly voice about the relations, toys, or other subjects of interest to the child. After communications have been opened up with the patient, and the utmost information obtainable by eye and ear has been secured, the actual examination may be begun. But attention should not, even then, be directed straightway to the affected part. Supposing, for instance, that the soundness of the right elbow be suspected, examination should begin with the left arm. As this causes no pain it excites no apprehension, and inspection of

the other elbow is readily permitted. It is advisable, moreover, to keep up a running fire of small talk with the child during the whole course of the examination, so that his attention may never have the opportunity of being directed to what is going on. At the same time the face should be regarded continuously, yet with apparent carelessness; for any slight, involuntary movement of the mouth may give evidence of the manipulation causing pain, even though the child, from very bravery, would not confess to being hurt. If at the time of the visit the child be asleep, part of the examination or inspection may be carried out before he wakes.

The first part of the examination should consist in the careful comparison of the land-marks, and then, little by little, further information may be sought. The endurance of the child must not be overtaxed; and he must not be made to cry, as the case might then be spoilt for further examination. But having once told the child that something *must* be examined, some little thing done, the same must be accomplished; he will soon find that firmness is not incompatible with kindness, and on the next occasion he will behave better. If it be a question of obscure pain or weakness in a limb or joint, it will be well to have the child stripped of his clothes, and to watch him leave or enter his bed; to see him walk (page 431), stoop (page 256), or run. This can be accomplished without needless exposure and chilling; but, as will be remarked later on, it is inexpedient to examine the child when he is but partially unclothed. When about to inflict necessary pain, the surgeon should on no account assure the child that he is not going to hurt.

Temperature.—Useful as the thermometer is in clinical work, too close an attention to its readings in the case of sick children may cause unnecessary

alarm. The information obtained should always be taken in conjunction with other indications. Thus, a high temperature may be of little moment if the aspect of the child be serene, and there be neither irritability or hebetude ; if the appetite continue good, the respiration, pulse, and secretions normal, and there be absence of rash, local inflammation, or sore throat. Parents are often caused much needless fear by being informed of the fluctuations of the temperature chart. Thus it is advisable, in many instances, that this record be kept as a confidential communication between the nurse and the surgeon. The temperature may be taken in the groin, or, if the child be very restless, in the rectum. Even in perfect health the child's temperature may be a degree or so above the normal.

The temperature may have no direct connection with pathological processes ; its variations may be the result of a want of due organisation of the nervous system. In a boy, after lithotomy, the temperature suddenly ran up to 105° F. It was evident, however, that there was no cause for alarm ; the child was lying calm and contented, and was interesting himself in some picture-book or toy which he was holding up for view. In a few hours the reading of the chart was again normal, and convalescence was duly completed. It is the steady ascent of the temperature that forebodes ill, just as it is the gradual fall in the barometer that surely tells of the coming storm :

" Long foretold, long last ;
Short notice, soon past."

In the peevish or excitable child, a trivial incident may send up the mercury several degrees ; and time after time have we found the administration of a dose of castor oil, the alteration of a splint, or the change of a dressing bring the index again to the normal

line. On one occasion, the distribution of sponge-cakes through a ward, by an injudicious friend, produced a general elevation in the temperature of its occupants. This much is certain, that if after several trials with the thermometer the reading be found normal, there is no need for anxiety ; in this way the instrument may prove of great value even in the hands of those who are but little skilled in the matter of diagnosis.

The **pulse** affords but slight trustworthy information of the physical condition ; one requires to know the child, and to know the pulse also, before proceeding to draw inferences from what seems to be a departure from the normal. The pulsations, especially in the case of a nervous child, may vary by fifteen or twenty in the minute, from insignificant disturbing causes.

Towards the *end* of the examination the child should be asked to put out the **tongue**. If he refuse, and remain deaf to entreaty, a view may generally be obtained by compressing the cheeks between the finger and thumb ; on the next occasion he will probably yield at the first request. It is interesting to notice the way in which the child spreads out the fingers when protruding the tongue to the utmost ; the result of a natural association of muscular actions. If a child complain of feeling ill, or be suspected of being out of sorts, it should be a matter of routine practice to inspect the throat (page 19), otherwise diphtheria or scarlet fever may occasionally advance without detection and without being suspected.

All proposed operations which are not urgently called for, should be carried out only after careful consideration and preparation ; and should there have recently been a case of scarlet fever in the ward or in the house, it will be advisable to postpone operation until time, and a thorough disinfection,

shall have diminished to the utmost the risk of infection.

The urine should be carefully examined for a day or two previously, especially for the presence of albumen. The throat and tongue should be inspected, and the morning's record of the temperature be specially noted. These precautions are necessary in order that the child may not be submitted to active surgical interference when, perchance, he is sickening for measles, scarlet fever, or other zymotic disease. In some instances it is necessary that a cutting operation be performed on a child whose urine is decidedly albuminous; as in the case of the child with amyloid disease of the liver and kidneys, secondary to chronic suppurative arthritis (page 457), or in the subject of interstitial nephritis from vesical calculus. But one would decline to operate for cleft palate, hiatus of bladder, or any other condition not included under the head of "urgency," unless the working of every organ were deemed efficient. If, for instance, the child were the subject of diarrhœa, or the bowels were unusually loose; if his appetite were failing, or if he were not looking well, any operation that was not deemed urgent had better be put off until he had settled down into good health again. **Early morning is the best time for operating**, as the child is thus less disturbed by being kept without food. He should know nothing about what is to take place; certainly he should not see any instruments, or preparations for the operation, and the anæsthetic should be administered before he is taken out of his bed. In private practice I keep out of sight until the child is insensible, and allow the anæsthetist to bear the charge of having "hurt" him; in the matter of subsequent dressings, I come as a sympathetic friend to heal the wound which "the other man" has inflicted.

When an operation is to be performed upon a child,

the surgeon should insist on the advisability of the parents not remaining in the room. Their presence is apt to be embarrassing, especially if anything go wrong either with the anæsthetic or with the operation. It is advisable, too, that, unless the understanding between the surgeon and parents be thorough, the former do not commit himself to an absolute expression of opinion, as to the nature of the fluid in a fluctuating tumour of a child, until that same fluid has been removed. Serum may be found where pus has been thought to exist, while the exploration of a suspected abscess may reveal sanguineous effusion, or, worse still, malignant disease. Lastly, when chloroform is to be administered for an operation, the anxious parent should be promised that nothing shall be done until the little patient is thoroughly under its influence, and that any cries which may be heard will surely not be the expression of pain. And this promise should be loyally kept.

Anæsthetics.—No painful operation or wearying examination should be conducted without the aid of an anæsthetic; chloroform is best adapted for the purpose, given on a piece of lint. After the operation, and when the child has given evidence of recovery from the narcosis, the room should be darkened and kept quiet, and he should be encouraged to have a long sleep. The stomach will not be ready for food until after two or three hours, and then only water or a small quantity of milk and water should be allowed. If by chance the child become alarmingly feeble during the operation, he should be held head downwards, so that the vascular supply of the brain may be restored, artificial respiration being performed if necessary (page 38).

Children who are out of condition.—A child under prejudicial hygienic influence is a bad subject for surgical operation, and in his person

slight injuries are apt to be followed by much disturbance. When circumcision is performed, the wound may become foul and sloughing, and the healing be long protracted. Or if such a child be operated on for hare-lip or cleft palate, no attempt at primary union may follow. Such are the children with whom a slight sprain is apt to be followed by an attack of acute or chronic synovitis, or even of suppurative arthritis: and with whom an injury, which would pass almost unnoticed in a strong child, is followed by cellulitis or abscess. Many a fat and heavy child is of this weak and flabby nature; the limbs may be large and dimpled, and the frame apparently robust; but the bones may be soft and friable, the blood wanting in coloured elements, the muscles ill-developed, and the power of resistance feeble.

Pressure sores are extremely apt to occur; often they come without previous complaint of pain. In the course of time all soft padding becomes hard, so that however carefully cotton-wool may be arranged at the time of adjusting a splint, the surgeon should make an inspection of the part every now and then; and he should never disregard the child's complaint of "soreness" under a splint or jacket. The heel is a very likely place for the appearance of a sore, and in arranging a limb, after an excision, for instance, there should be plenty of padding along the calf and down as far as the hollow above the insertion of the tendo Achillis; but the padding should not be stuffed under the heel itself. If a child develop a sore about the sacrum, and in certain weakly subjects this happens in spite of every care, he should at once be placed in the prone position, with his head turned to the foot of the bed, so that as he lies he may see what is going on in the room.

Commencing sores, or a threatening redness, should be washed twice daily with brandy and water,

or with a weak mercuric solution, and, having been carefully dried (not rubbed) should be dusted with starch powder. In making the bed of a child who has to lie long on his back, the clothes should be very smoothly arranged, and crumbs and such like things should not be allowed to collect in the bed.

Multiple abscesses in infants at the breast.

—A succession of abscess in the subcutaneous connective tissue, and even in the intermuscular spaces, are occasionally met with in infants at the breast. It is by no means satisfactory to ascribe them, as Bouchat has done, to the syphilitic or strumous diathesis. I am disposed to attach a close connection between them and a chronic form of blood-poisoning, the result, perhaps, of infection at the truncated umbilical cord. Roulland reports the case of an infant who was in a satisfactory condition as regards health and surroundings till he was weaned, when he was attacked with diarrhœa. The abscesses which then appeared subsided with the diarrhœa. A second attack of diarrhœa, after an interval of three months, was followed by more abscesses. He believes that the child was inoculated by absorption of septic material from the bowels.

Escherich is of opinion that the abscesses are due to some swarms of staphylococci, which abound in the liver of all sucklings, colonising in the connective tissues.

The treatment should comprise fresh air and cleanliness, and the prompt incision and washing of each abscess as it forms, under chloroform. I have recently had an extremely bad case of this disease, evidently of a pyæmic nature; but, with help, the infant successfully struggled through the attack. There was no suspicion of syphilis nor struma, nor had the mother had any puerperal trouble.

Scarlet fever is strangely apt to occur after any cutting operation, the germs being probably absorbed

through the wound. Such inoculation may take place in spite of the use of lotion and gauze, and its effects may be manifested within twenty-four hours of the operation. The rash is not to be euphoniouly called "erythema," or "surgical scarlatina"—it is genuine scarlet fever;* it can convey infection even to an adult, and may be followed by desquamation and albuminuria. The child thus attacked should at once be isolated, but it does not follow that the result of the operation will be a failure. Sir James Paget has suggested † that children who have died with obscure symptoms a day or two after operation, may have succumbed to the influence of scarlet fever poison, which had been hindered in some way from making its usual progress. Erysipelas occasionally follows on the so-called "surgical" scarlet fever. In the case of a boy with post-pharyngeal abscess which was opened in the neck, scarlet fever set in, and subsequently facial erysipelas, from which, however, he ultimately recovered.

All medicines should be given in the most palatable form. Castor oil loses none of its efficiency by being shaken up in a bottle with a little warm milk and sugar. The smallest bulk is desirable as a dose; and, perhaps, it may be said that the less medicine given to children the better. One must not lose sight of the fact, however, that *opium* is a very valuable drug in the surgery of childhood. Some children can take it with great freedom and advantage, but it is well to begin with small doses, and to go on increasing them until the desired effect is produced. The simple tincture or camphorated tincture is the best form for administration. The first doses should be given every half-hour, or every hour, until ease of pain, drowsiness,

* Harveian Lectures; *British Medical Journal*, March 6, 1880.

† "Clinical Lectures," p. 352. 2nd edition.

or commencing contraction of pupil gives evidence of the effect being produced. The dose is a minim of the tr. opii for each year up to five or six, the child being carefully watched.

If a child refuse to take medicine it may be administered by a small syringe, fitted with a piece of indiarubber tubing long enough to reach beyond the back of the tongue.

Leeches should not be entrusted to the care of an unskilled nurse. It may prove a difficult matter to stop the bleeding from the bite, acupressure or suture being at times required. Children bear the loss of blood badly; nevertheless it is extraordinary to see with what speed they may recover strength after a prolonged and exhausting operation, as for cleft palate.

Antiseptics.—Caution is given elsewhere in connection with the employment of corrosive sublimate (page 271) and carbolic acid (page 465); a word must be said here about *iodoform*. Just now it is the fashion to use it freely even in the case of extensive wounds in children, and as a rule it does no harm. But sometimes it has a directly poisonous effect. The child becomes restless and excited, and perhaps he vomits; the temperature goes up, and the pulse quickens, and in a few cases I have seen an erythema which, I think, must have been due to absorption. The symptoms are often a good deal like those of pyæmia, but on discontinuing the use of the drug they promptly disappear. But unless the drug be discontinued the child may become dull and stupid, or excited, and the excitement may pass into delirium or even into mania. Sometimes the symptoms of iodoform poisoning in children bear a close resemblance to those of tubercular meningitis (page 67).

Poultices are inconvenient; the warmth and moisture which they afford may be better supplied by a fold of lint wrung out in warm water, and applied

under indiarubber tissue to prevent evaporation. The waterproof may be secured by a bandage. But the greatest care must be taken lest the application be needlessly warm; the child's skin is extremely delicate, and a hot-water dressing may cause most serious sloughing and ulceration (page 157). Similarly, the application of **blisters** may give rise to gangrene, or to a profuse suppuration which eventually entails a fatal result.

We would speak highly of the value of *sunshine* in the treatment of sick children. If a child be not making satisfactory progress in one part of the ward, it is well to put him into a bed where the sun shines during a good part of the day. Even early after a serious operation, it is advisable to get the little patient carried out on to a balcony, into a garden, or to an open window, and there laid in the sunshine, due precaution being taken against cold.

Vaccination should be performed in the second or third month. The skin just above the insertion of the left deltoid is cleansed, and is scratched into with cross lines by the point of a clean lancet, in four places, distant from each other about half an inch. Fresh lymph is applied over the places, and is allowed to dry before the arm is again put through the sleeve. Thus done, the operation is associated with neither pain nor bleeding. Subsequently the dermatitis may be relieved by smearing the part with cold cream and dressing with a layer of cotton wool. A "shield" should not be worn, as it is apt to become soiled and septic, and by shifting its place to bruise the sores. If the discharge become offensive, or thick, and if hard scabs form, lint soaked in sanitas lotion may be applied, and later, the unhealthy ulcers may be dressed with vaseline and sanitas.

If more care were paid to improving the general health of an infant before subjecting him to

vaccination, there would be still less complication, and wild and ignorant objections to it would decrease. Vaccination should never be performed from an infant about whom there can be the least suspicion of venereal taint; nor should lymph be taken from a puny or unhealthy child. The lymph should not be stained with blood, and the family history of the child from whom the lymph is obtained should be known to be good.

About food, etc.—Human milk is the proper food for babies, and they should have nothing else. But if that cannot be got, or prove insufficient, fresh cow's milk is the next best food. The bottle should be filled with a mixture of cow's milk and hot water, in which a lump of white sugar and a very small pinch of salt have been dissolved. For the first few months there should be more water than milk; perhaps, *twice as much water as milk*; and as the babe thrives the proportion of milk may be gradually increased. No other food should be given before the sixth month; baked flour, arrowroot, and oatmeal cannot be digested; they may cause sickness and diarrhoea. Milk for the nursery should first be boiled, as the curds formed during digestion are thus rendered less hard and massive, whilst the risk of any infection being conveyed by the milk is greatly diminished. It is not advisable that the milk come always from the one cow.

When to give it.—For the first month a baby should be fed every two hours, and, by gradually increasing the interval, he is in time fed every three, and, eventually, every four hours. He should not be fed because he cries; very likely he is in pain because his stomach is overloaded. When he is sick, he should be fed for a less time and at shorter intervals, and if the bottle is being used, a larger proportion of water must be added. If a fair sleeper, he should be woke up for his regular meals. A table-spoonful of lime-

water may be added to each bottleful of food, especially in summer.

How to give it.—The best kind of feeding bottle is the old-fashioned, long, straight one, with a short indiarubber teat and with no tube at all. The worst kind is that with the long indiarubber tube. There should be two bottles, one for day and one for night; after being used, the bottle should be washed in hot water, in which a little soda has been dissolved, and should then be rinsed in cold water. Till next wanted it should be kept in a basin of clean, cold water. When six months old, the baby may be allowed, in addition to milk, boiled bread and milk, oatmeal, baker's rusks, or Chapman's wheat flour. When about nine months old, the mother should begin to wean him, by giving him less of the breast or bottle and some of the foods just mentioned, or beef-tea or mutton-broth, and soaked bread. At a year old the child should be entirely weaned, and soon he must have daily a little undercooked meat pounded up into a pulp, with gravy and salt; some potato, finely mashed and covered with gravy, an egg, or a little milk pudding. On no account should he be allowed wine, beer, tea, or coffee, though he may have cocoa and milk. He should be given his meals regularly, and should not pick at bread and butter, cakes, and sweet-stuff in the intervals. Children flourish best on fresh foods. The worst nourished patients are generally those reared on Swiss milk and various patent foods.

Clothing.—Babies and young children must be kept always warm; they cannot be hardened by scanty clothing or cold baths. Neck, thighs, legs, and arms need to be covered as well as the chest and body.

Fresh air.—Children should be taken out of doors daily when the weather is fine. If they be sent out in a perambulator, the feet and legs should be warm

to start with, and well covered throughout the ride. Unless a bitter wind blow, or it be foggy, the windows should be opened for a while, fresh air being necessary. If a child wet the bed, perspire freely, or kick off the bed-clothes, he should wear a flannel bed-gown long enough to be tied below his feet, and the bed-clothes should be securely tucked in. He should not be rocked or patted to encourage sleep, which should come naturally, and, like food, at regular intervals.

Bathing.—Morning and night he should be washed over in warm water, but he should not be exposed long enough to feel chilly afterwards. A handful of sea-salt, thoroughly dissolved, may be added to the bath. Except in the very warmest weather, a young child should not be put into a cold bath.

CHAPTER II.

“CROUP,” DIPHtheria, AND LARYNGITIS.

“CROUP,” diphtheria, and membranous laryngitis are probably the same disease, produced by the absorption of poisonous germs. This theory forms a good working hypothesis, and its acceptance ensures the adoption of strict measures for the isolation of infectious cases. The chief argument against it is that croup is not so contagious a disease as diphtheria; but this is, after all, only a matter of degree.

In an outbreak of diphtheria the earlier deaths “may be referred to croup, the later to diphtheria.”* The subjects of croup were those in which the

* Thorne Thorne; quoted by Millican in “The Evolution of Morbid Germs.” 1883.

exudation was confined to the larynx or trachea. "Diphtheria appeared to be developed from what was originally a simple sore throat, and the infectious character was gradually increased; it was possible that diphtheria had a pedigree. Might not membranous croup occupy a position in the development of the disease intermediate between sore throat and diphtheria?"

On the same page is quoted a case which occurred in my own practice. Tracheotomy had been performed on a child, for, as it was thought, ordinary acute laryngitis; and next day the child was playing happily with its toys. In four days she was quite well again. We felt satisfied that the case was not one of diphtheria; but in a few days the father, who was much with the child, contracted diphtheria. Tracheotomy was performed, but he died, notwithstanding.

The common *age* of the subjects of diphtheria is from two to six years. As regards the period of *incubation* nothing definite can be affirmed; if we say "about a week" we shall probably be not far from the mark, though sometimes the uvula is found red and swollen, and the fauces inflamed, only a few days after exposure to infection.

The *cause* of the disease is not always to be determined, especially if there have been no cases of sore throat in the neighbourhood for some time. The drains or closets may be grossly at fault; or in some direct or roundabout way a sewer may be ventilating itself into the house, or the room in which the child lived or slept; or the drinking water may be poisoned by a neighbouring soil-pipe or cesspool. I know of three instances in which the disease seemed directly due to the inhalation of air laden with the odour of manure, which was being carted along the road or spread upon a field. Children are highly susceptible to such

influences; even more than adults do they demand fresh air and pure water, their mucous membranes being extremely sensitive.

Quite probably the virulence of the disease is brought about by the influence of germs; innocent, possibly, in their early development, they may become morbid from association with sewer-gas or drain-water, and, entering the system, may produce fermentative changes which give rise to a mere sore throat, gastric catarrh, diarrhoea, or diphtheria. If the child be strong or the germs indifferent, the exposure may end in a passing attack of soreness of throat, whilst in other children unequivocal diphtheria may occur. It is beyond question that diphtheria may give rise to membranous laryngitis without the occurrence of patches upon the pharynx.

A direct association may exist between damp walls, or the mouldy patches clinging to them, and an outbreak of diphtheria. Therefore, the land about the dwelling-house should be thoroughly drained, damp rooms well ventilated, and mouldy walls frequently covered with lime-wash. A child with an ordinary catarrhal sore-throat, if exposed to the atmosphere of sewers or faulty closets or sinks, is peculiarly liable to be attacked with diphtheria, the fungoid organism seizing upon, and undergoing its malignant evolution in the enfeebled membrane. I am strongly of opinion that these fungi are harmless at first, and that they need, so far as one can ascertain, a resting place upon a suitable mucous surface or other animal tissue, in order that they may attain their highest development. They are primarily entangled in the saliva, and are then absorbed into the pharyngeal or tonsillar membrane; or, passing that favourable area, and entering the larynx with the inspired air, they find a resting place in the delicate lining of the larynx. If the receptive tissue were in

perfect health, it might, perchance, be able to withstand their attack, but if it be rendered peculiarly vulnerable by some constitutional dyscrasia or local catarrh, the worst results follow. Thus it comes about that the child with a "weak throat," or who is "croupous," is specially liable to be attacked with diphtheria, and thus a simple local inflammation becomes malignant and infecting. Further, with a persistence of unhealthy surroundings, diphtheria may become a chronic disease, breaking out from time to time with renewed energy. In America it is far more often encountered as an epidemic than it is with us, probably because that country possesses larger tracts of damp, ill-drained land.

There are cases of diphtheria on record in which the disease broke out directly after a fall into foul, stagnant water, in which, probably, the fungus had long been quietly developing. It is not unlikely that potential diphtheritic germs are lurking wherever animal or vegetable matter is decomposing; children, therefore, should be kept away from stagnant water, manure-heaps, cesspools, piggeries, and open drains. They often get sore throats when exposed to such sources of infection, and fortunately the disease often shows itself in no more serious form. In London a large proportion of the cases of diphtheria come from the neighbourhood of stables and cow-sheds. The disturbance of heaps of manure or decaying refuse, and the cleaning out of stables and cow-sheds, are apt to be followed by an outbreak; and so, also, after heavy rains, by foul water contaminating drinking water.

There is small doubt, I think, but that diphtheria may affect, and be propagated by, cats and other tame animals, including poultry. (*See "Report" of Dr. Bruce Low, Local Government Board, 1888; also Archives of Pediatrics, p. 619, 1888.*)

In the case of diphtheria spreading amongst

c—19

families who are served with milk from one particular dairy, it by no means follows that the infective material has been introduced into the milk on account of imperfect surroundings. It is quite possible that one or more of the cows supplying it may be the subject of some obscure disease, which renders the milk capable of originating diphtheria in the human subject. Whether bacteria be the cause of the disease or merely its constant associates, is far from settled.

The term "Croup" was suggested by the peculiar sound which accompanies inspiration; its associations are with larynx and trachea. We should do better without the word; it merely expresses a single symptom. "Diphtheria" is derived from *διφθέρα*, leather, from the appearance of certain patches or skins of grey exudation upon the soft palate or pharynx. These patches may be seen on depressing the tongue, or even on getting a child to open the mouth in a favourable light. But it is not always easy to view a child's throat, much less to apply remedies to suspicious patches on its mucous membrane. When diphtheria attacks a wound, covering it with an unhealthy film, the constitutional effects are manifested without the throat being implicated. But such cases are, in my experience, very rare.

Similar patches in the wind-pipe would not be visible, though they would be associated with dyspnoea, exhaustion, and other urgent signs. Croup is the disease when diagnosed by the ear; diphtheria, when diagnosed by the eye. The two forms of the disease often coexist; but every case of croup is not due to the presence of diphtheritic inflammation. (See pages 34 and 36.)

Moreover, all cases of diphtheria do not run the same course, any more than do all cases of scarlet fever. In the latter disease we know that sometimes

there is no cutaneous rash, and at other times there is no angina, or no marked rise of temperature. Some of the milder and more anomalous cases of diphtheria look like "herpes of the throat" merely, and throughout the entire course of such an attack there may be neither enlargement of cervical glands, albuminuria, or rise of temperature. In fact, as Jacobi remarks, the continuance of a low temperature with the croup-symptom points to its diphtheritic nature; catarrhal laryngitis begins with fever.

Sometimes in an epidemic, the diagnosis of an abnormal but suspected case of diphtheria is masked by the presence of an extensive *rash*, which is probably of a septicæmic nature, but which may be highly suggestive of measles (especially if there be much nasal discharge), or of scarlet fever. In such circumstances, though it may be impossible to form a positive opinion as to the nature of the case till after the lapse of several days, strict quarantine is, of course, to be observed.

When asked to see a child who is feverish without apparent cause, the surgeon should at once inspect the throat. Such a rule is excellent, as diphtheria is apt to come on very insidiously. There may be no prominent symptom, though the lymphatic glands about the angle of the jaw may be found enlarged and painful, and the urine albuminous. Sometimes on looking at a "sore throat" one is shocked to find it covered with ominous patches. Although exhaustion is one of the chief associations of this false membrane, still, children may be seen with one or both tonsils swollen and marked with grey patches, when there had been nothing to suggest the existence of serious disease. Such cases in the out-patient waiting-room may widely spread the disease. A mild diphtheria may quietly run its course without attracting attention, or even without recognition. It may be only when the

inflammation spreads to the glottis that its urgent nature becomes manifest. A mild attack may clear off so happily that the correctness of the diagnosis of diphtheria may be questioned; a well-directed quarantine may be thus prematurely relaxed, and disaster follow. The patient with a mild attack, imperfectly isolated, may spread infection which produces the disease in its most virulent form. Too much care cannot be paid to the matter of isolation, and so long as a doubt exists as to the exact nature of a suspicious tonsillar or pharyngeal inflammation, needless risks should be studiously avoided.

The **false membrane** is a tough and fibrinous exudation in which pus corpuscles are incorporated, as well as epithelial elements shed from the inflamed tissue beneath. The film may be so intimately connected with the mucous membrane that after it has been detached the exposed surface is found raw or ulcerated; during life a bright inflammatory border surrounds the patch. The natural loosening of the exudation film is effected by the infiltration of mucopurulent fluid beneath. The exudation may extend down into the smallest bronchi. In certain cases it may be first formed in the trachea, whence it may spread into the larynx or pharynx, or down into the lungs.

When a patch is found upon the tonsil, the inflammation may extend deeply through the mucous membrane, and involve the subjacent tissue in a species of moist gangrene. Thus extensive excavations, foul and bleeding, may be formed. This condition shows the disease in its most virulent form, and presages ill. Fatal hæmorrhage may be determined by the sloughing. An opposite form of the disease is that in which, when the false membrane is detached, the mucous lining beneath it is found merely hyperæmic, and with no trace of ulceration. This is known as *superficial diphtheria*, and though the course

taken by it may be short, and attended with but slight constitutional disturbance, it may prove highly contagious. If discharge, stained, maybe, with blood, trickle from the nares, a sneeze would widely scatter the disease germs.

Membranous exudation in the wind-pipe may be produced by mechanical and chemical irritants apart from laryngeal diphtheria, and there is some evidence that membranous laryngitis has followed exposure to cold; but the more that I see of "sore throats" with laryngeal obstruction, the more firmly do I hold the belief that they are all diphtheritic.

It does not follow that because a child has pharyngeal diphtheria the larynx will be involved. But even if the inflammation do eventually spread to the glottis, the virulence of the disease may have been so far expended, that dyspnoea may not advance to an extreme degree.

There is no line between the pseudo-membranous slough of diphtheria and the fibrinous exudation of croup: one passes gradually into the other. The sloughing corresponds to the more intense, the simple exudation to the milder action of the morbid cause. The sloughs may involve the vocal chords, and from thence downwards the deposit may become of a more simple, membranous nature. Senator strongly advocates the identity of the disease, whether affecting the fauces or larynx. He holds that the affections of the larynx form a part of diphtheria, just as those of the pharynx and kidneys form a part of scarlet fever.

Sometimes the virulence is so great that the child sinks of blood poisoning before membrane has had time to be produced, the throat appearing merely congested or inflamed. Bright red patches on different parts of the fauces are highly suggestive of diphtheria; they quickly become covered with the grey film. At first the disease may be an entirely local affection;

sometimes its whole course is run without constitutional disturbance. And manifestly the diagnosis of such a case might for a time be obscure; but a high temperature, the possible existence of albuminuria, and the occurrence of like cases in the same house or neighbourhood, would be highly suggestive; yet the temperature may be but little elevated, although the disease is raging. The glands in the neck and at the angles of the jaw soon become enlarged and tender, and the connective tissues swollen.

The appearance of *albumen* in the urine is an important feature of the disease. In an obscure case its presence may confirm the diagnosis. The albuminuria is associated with parenchymatous inflammation of the kidneys, and hæmorrhages, and may appear as early as the first day of the disease, but it does not occur in all cases.

The associations of the *croup symptom* are cough and feverishness; then increasing trouble with respiration, the voice becoming hoarse. Later on the cough becomes loud, ringing, and "brassy." When once heard it cannot be mistaken. The restlessness and fever increase; the voice grows weaker, and though the poor child's lips are seen to move, the words cannot be heard. He is extremely anxious, and if he fall into a doze he wakes up with spasmodic dyspnoea; he grasps his throat, or puts his fingers into his mouth as if to clear away the cause of suffocation. When the spasm passes off, the face and body are covered with beads of sweat, and the night-dress may be wet. Between the attacks the inspiration improves, but the air still enters with a noise which is not unlike that made by a saw working through a board.

The first symptoms may quickly supervene on exposure to wet or cold, or they may follow what was thought to be an ordinary sore throat; indeed, this is the general rule.

The **dyspnœa** is due partly to the muscles of the vocal cords being thrown out of working order, so that when an inspiration is taken they are driven into the rima by atmospheric pressure, but chiefly to the blocking of the glottis by false membrane. When *expiration* is prolonged and difficult, as well as inspiration, the presence of obstruction from exudation is evident ; prolonged and noisy expiration is a bad sign.

As the dyspnœa increases, the veins of the head and neck swell, the pale face becomes dusky, and the extremities grow cold. Then drowsiness steals in, and death may supervene from carbonic acid poisoning, bronchitis, pneumonia, pyæmia, or exhaustion ; the child remains sensible till death is close at hand.

The **prognosis** is always grave, the disease being one of the most dangerous to which childhood is liable ; the smaller the child the more easily does the glottis become obstructed. When it goes on to destroy life, not more than forty-eight or seventy hours elapse from the full development of the croupal symptoms to the fatal event. And, allowing thirty-six hours for the premonitory stage, the entire duration of the disease will be from four to six days (West). But sometimes the whole course of the disease is run in less than half this time. On the other hand, after tracheotomy, the child may rally for a time, sinking, perhaps, rapidly at last, on about the third or fourth day after the operation.

Increased frequency of respiration is invariably a bad sign, especially when it is accompanied with a rising temperature. Pneumonia is then to be feared. Cellulitis of the neck and enlargement of the glands about the angle of the jaw are unfavourable signs ; so also are the complaints of pain about the ear. This may be the result of pressure of neck-swellings upon the auricularis magnus, or some other nerve, or of an

extension of the inflammation along the Eustachian tube. The fatal result is sometimes preceded by emphysema of the neck, resulting from rupture of the pulmonary vesicles and escape of air under the pleura, into the mediastinum, and into the connective tissue of the neck.

Concerning the temperature, something may occasionally be learnt as regards the probable termination of the case, but one must not make too great a point of its observation. In certain cases one sees as much attention given to its registration as if it were a therapeutic measure. If, even in comparative health, a child's temperature may go up to 102° or 103° , it is little wonder if exacerbations in diphtheria be extreme; a persistently high temperature forbodes ill, so also does a rapidly falling one. Other unfavourable signs are an increasing amount of albuminuria, an unsteadiness or irregularity in the pulse, and sickness. Vomiting is a grave sign; it shows an irritable condition of the stomach, and its continuance must necessarily be attended with increasing exhaustion. It may be the result of molecular changes in the pneumogastric nerve, and may thus be a precursor of cardiac failure. It is a bad sign also when the urine diminishes in quantity and becomes darker in colour.

Though the **treatment of diphtheritic laryngitis** will be further alluded to in the next chapter, it may be here remarked that any medicine administered must be with the view of keeping up the strength. Quinine and iron are the most useful drugs; but if the child can swallow only with the greatest difficulty, it is inadvisable that he should be nauseated with medicines. So long, only, as he will take the dose with a little persuasion should it be given. Ten or twenty drops of tincture of iron given every hour or so in a teaspoonful of sweetened water is, I believe, the best medicine. Port wine, or brandy

with egg and milk, should be given freely, but not so as to nauseate the child. The throat may be swabbed with glycerine and perchloride of iron, glycerine and tannin, or some other antiseptic. But this local treatment, valuable as it may be, should not be persisted in if it cause distress or frighten the child. It is impossible thoroughly to disinfect the patches, and to worry a child until he is exhausted by resisting the local treatment is more likely to be attended by harm than good.

In the hours when diphtheria is a local disease, the application of a strong solution of corrosive sublimate or other germicide to the patches might avail much, but when the whole constitution is affected local treatment can be but supplemental. The use of corrosive sublimate is not entirely free from objection. Though children bear mercury well, free absorption of the sublimate salt may cause griping, sickness, or diarrhœa.

Perhaps there is no more satisfactory way of dealing with the patches than by blowing finely powdered iodoform directly upon them by means of an insufflator. This treatment does not distress the child as swabbing does, and the antiseptic influence spreads widely. An emetic of ipecacuanha may be of use in clearing the throat in an early stage of the disease, but it should not be resorted to when exhaustion has set in. Apomorphia is too severe a depressant for use in these cases.

Hot compresses may be applied to the front of the neck ; no other external application is likely to afford relief. The compresses may be sponges from which almost boiling water has just been squeezed by wringing them in a towel, and they should be constantly changed. This may do much towards relaxing spasm, but it should not involve delay in the performance of an inevitable tracheotomy. The patient must

always be closely watched ; a high temperature demands free stimulation and constant nourishment ; quinine in grain doses may be administered with the iron, or in milk.

The temperature of the room should be kept at about 65° to 70° Fahr., and the air should be moistened by a steam spray producer or a bronchitis kettle ; vapour of sanitas or cresolene should be diffused as well as steam, so as to diminish the foetid odour of the breath. The air must be kept fresh by judicious ventilation. Friends and relations must be kept out of the room ; there is danger of the infection being spread by them ; moreover, the sick child is disturbed by the sight of anxious faces. A sheet kept moistened with carbolic acid solution or sanitas should be fixed at the doorway, and there should be no needless passing to and fro.

Even if the attack come on in the height of summer a large fire should be kept up day and night. Thus a thorough ventilation is maintained, and, the current of air setting in from the door to the fireplace, there is less chance of infectious particles being carried into the rest of the house. The most suitable room is one at the top of the house, where isolation can be more strictly carried out. The carpet and all superfluous furniture should be removed. Unfortunately, an ailing or sick child is often brought into the parents' bedroom before the nature of the disease has declared itself. The sooner, however, that he is taken to the top of the house the better.

As the difficulty of breathing increases, the question of **tracheotomy** (page 39) presents itself, and the sooner that the operation is resorted to the less will be the chance of inflammation of the lungs or exhaustion impairing its success. The following are the advantages of an early recourse to the operation : The patient is better able to undergo it, the

strength is preserved, more nourishment can be taken and more sleep secured ; time is gained in which, it may be hoped, the disease will have run its course, and it is not unlikely that by the re-establishment of the free entrance of air into the lungs, pulmonary complications may be averted. I recently performed laryngotomy on a lady, who had caught diphtheria from her child. A few hours after the operation she made signs for paper and pencil, and wrote, "Such perfect bliss from suffering." Surely the prospect of this bliss should be offered to *every* patient who is suffering from the dyspnœa of laryngeal obstruction. It is not easy to perform tracheotomy too early ; it should be looked upon as a therapeutic measure of extreme value, not as a last resource.

Nasal diphtheria may be the starting, or a complication of the attack, and is often of an extremely virulent form. The discharge excoriates the nostrils, and may even set up dermatitis of the lip. The discharge is sometimes associated with epistaxis and with the escape of shreds of false membrane. The local treatment consists in, if practicable, hourly syringings with warm boracic lotion, the child being placed upon his side and the injection being made by the upper nostril. The injection returns partly by the other nostril and partly by the mouth, and if some of it enter the stomach no harm is done, as might occur if a mercuric or carbolic wash were used. The flakes of false membrane which come from the nasal fossæ are not so firm as those from the pharynx, and in a case of this sort which was recently under my care a large flake was found to be completely, though slowly, soluble in water.

Tubage.—Recently it has been again suggested, and actually demonstrated, that the introduction of a flexible catheter through the natural air passage may be the means of temporarily overcoming a

spasmodic attack of dyspnœa ; but this is not a trustworthy substitute for tracheotomy. The catheter would become quickly blocked with exudation, and it could not be cleaned without constant removal. The nurse could not be entrusted with the management of such an arrangement. Lewis Smith remarks that in experiments on animals the tube caused ulcerations. The antero-posterior diameter of the tube used by O'Dwyer is greater than the lateral ; it is introduced by raising the epiglottis with the index finger, which is guarded and thrust to the back of the tongue. The "introducer" and the tubes of O'Dwyer are extremely ingenious, and in America, where they must now have been used in upwards of 1,000 cases, they have acquired a good reputation. Out of 806 patients thus treated 221 recovered. The metal tube is, however, apt to be coughed up, to slip into the trachea, or to pass into the alimentary canal ; it may be choked by mucus or blocked by false membrane ; and it may prove inefficient and have to be discarded in favour of tracheotomy. Though the tubes may be found useful in certain cases they are not likely to meet with such wide adoption as tracheotomy at present enjoys. In an urgent case of laryngeal diphtheria the surgeon stands in need of treatment which can be depended upon to supply complete, immediate, and uninterrupted relief ; and these demands tracheotomy alone affords. When about to use the tubes in a serious case, the tracheotomy instruments should be in readiness.

(For further remarks upon this subject see "Year-Book of Treatment" for 1889 ; and the *British Medical Journal* of September 29, 1888.)

The **convalescence** from diphtheria is full of anxiety. Frequently, when it seems well established, the child begins to fail from an unwillingness to take food, or from an inability to retain or digest it.

Sometimes a sudden attack of dyspnœa or rapid exhaustion may bring on a fatal result. Fatal collapse may be due to arrest of the heart's action, through paralysis of some of the pneumogastric or other cardiac nerves; or it may be due to fatty degeneration of the ventricular walls, or to the slow and quiet formation of a thrombus. The child may be happily amusing himself with his toys when, after a few convulsive gasps, all is at an end. Such a calamity may supervene without any warning and when least expected. An attack of diphtheria predisposes a child to future attacks, or, at any rate, offers him no immunity from them.

Muscular paralysis may occasionally be associated with, or follow an attack of diphtheria after two, three, or four weeks. The power of accommodation is lost, letters and pictures being confused. The voice becomes "nasal;" food goes the wrong way, and the child grows thin. The soft palate is motionless, and, flapping as the child breathes deeply, it is noticed that he snores in sleep. The muscles of the palate are often the first to be affected and the last to recover. In those cases which are attacked by paralysis this symptom generally appears in the second or third week from the beginning of the illness.

The absence of "knee-jerk" may be an early, prominent, and lingering symptom, but the legs may have become weak or unmanageable before it is detected. The child may tumble as he walks, and may become ataxic in his hands. The limbs, intercostals, and even the diaphragm, may be affected, death occurring from asphyxia, pneumonia, or syncope.

The *pathology* of the paralysis is obscure (such paralysis of the muscles about the glottis, which is associated with the inflammatory infiltration of the acute disease, is not here alluded to). The weakness

of the muscles of the limbs, or the absolute paraplegia, may be secondary to some lesion in the anterior column of the grey crescent of the cord, and is thus allied to infantile paralysis (page 162). * The fact of the paralysis often completely passing away must be taken as evidence of its not being always due to destruction of ganglion cells; in such cases it may possibly have been the result of inflammation of nerve trunks or branches. Serious paralysis may come on with great suddenness, and after the most transient form of the disease. In one case a child was well advanced in convalescence after a mild attack of diphtheria, and in the morning was found hemiplegic, and unable to speak. Very gradually did the muscular power return. The *prognosis* is uncertain. When the branches of nerves which are associated with circulation, or which preside over respiration, are involved, the prognosis is more unfavourable than when only nerves of palate or extremities are implicated. Paralysis following an attack of diphtheria when the nature of a transient sore throat had escaped recognition, might appear inexplicable. An erratic selection of certain groups of muscles for paralysis, those of the soft palate and larynx to begin with, and then those of the orbit, trunk, or extremities, would afford unmistakable evidence of the paralysis being a diphtheritic complication. Indeed, on the subsidence of the diphtheria the reflexes should be daily examined. Exaggeration of knee-jerk may foretell a coming paralysis, although the muscles of the lower extremities may never be affected; and after a while the knee-jerk may be lost although merely the palatine muscles are paralysed.

The *treatment* should first comprise the internal administration of strychnia and belladonna, as a tonic to respiratory muscles, and, later on, the use of

* Kidd; *Medico-Chirurgical Transactions*, vol. lxvi.

galvanism. The most important matter is to preserve the nutrition of the child if deglutition be interfered with; if he cannot swallow without food passing into the larynx he will at last abstain from all attempts at swallowing; then it will be necessary to feed him by a soft catheter introduced through the nares (page 52). Frictions with cod-liver oil, and the administration of nutrient enemata, may also be of service. The belladonna must be given every hour in doses of from five to twenty minims. A boy under my care with phrenic paralysis, whose bronchi were becoming loaded with mucus, and who, on account of diphtheritic paralysis of the pharynx was unable to swallow, was successfully treated by the hourly administration of gr. $\frac{1}{60}$ of atropine hypodermically.

General advice.—If there be doubt as to the exact nature of a sore throat, the child should be at once isolated, and, if possible, a trained nurse should take charge of the case; all other children should, if practicable, be sent out of the house. The mother must understand that resigning her child to the nurse is all to his advantage, and should be considered as a mark not only of common sense but also of affection. It is difficult, however, to get parents to take this view of the matter; and sometimes they will not be persuaded that the child is really suffering from diphtheria. If there be doubt as regards the nature of a suspicious inflammation, or patch, about the fauces, let the benefit of that doubt be accorded to hygiene. A few days' quarantine is a simple matter, and it may be the means of obviating great distress. In the case of diphtheritic hemiplegia mentioned above, the disease had been taken from the mother, who had so slight a soreness of the throat that not only was she not laid up, but was doing her work without interruption. Others of her children were also affected, some fatally.

The nature of the disease may be declared with certainty only on the occurrence of albuminuria, exhaustion, or characteristic paralysis; or by the individual becoming the centre for fresh infections. Goodhart * says, in connection with the doubtfulness which may overhang the diagnosis of certain cases of sore throat, "It is much better to confess to some uncertainty than to make light of a complaint which, perhaps, is subsequently proved to be of scarlatinal or diphtheritic nature." Not only for the sake of the patient, and for that of other members of the household, but also for the reputation of the medical attendant, should this advice be attended to.

Those about the child should be careful not to inspire whilst leaning over to paint the throat or to clean the tube. And when the patient coughs through the mouth or tube, there should be no thoughtless exposure to the column of expired air. Brothers and sisters who have been with the sick child must not mix with other children, lest, though they at present show no signs of disease, their breath, or saliva, be the means of spreading infection. It is through some direct source that the contagion is usually propagated, but particles coughed upon a coat or dress, drying there, and subsequently brushed off and inspired as dust, may give rise to infection. Such particles may hang about the furniture or walls of the sick room and cause subsequent infection. The greatest care should be taken about disinfection, even though the disease may be rarely propagated except by direct contagion. Sponges and feathers should be burnt, and towels plunged in a pail containing a solution of carbolic acid or corrosive sublimate. The fumes of burning sulphur are the most valuable general disinfectant for rooms and clothing. Indeed, the periodical burning of sulphur in the sick-room is

* "The Student's Guide to Diseases of Children," 1885.

expedient ; children are but little irritated by the fumes. Discharges from the patient should be received in vessels containing carbolic acid powder or some other trustworthy disinfectant.

Those in attendance should be liberal in the use of disinfectants, and should, as a special precaution, wash out the mouth and gargle the throat from time to time with some mild astringent. And when the atmosphere of the room is abundantly laden with the germs of the disease, and mucus from some cause or other is hanging about the fauces of the surgeon, he need not hesitate to set the example of clearing the throat, and to rid himself, in what may not be generally considered the most refined method, of a likely source of infection.

In order to reduce to the utmost the chance of carrying about infection, every one whom duty calls into the sick room should have a loose dress, hanging at the entrance, with which he can cover his other clothes. But it is usually impracticable to carry out this desirable precaution.

Lastly, when death has released the child, the sooner the body is removed from the house the better. On no account should friends or relatives, who have hitherto been denied intercourse with the sick-room, be now admitted. The last offices should be quickly performed, the body being enclosed in the shell together with plenty of carbolic acid powder, chlorinated lime, or other disinfectant. The funeral should take place within forty-eight hours after death, and should not be an occasion of a gathering of friends or relations.

Convalescents from diphtheria should be regarded with suspicion, and kept apart from play-mates and schoolfellows. Though the attack may have been slight, and its manifestations have definitely passed away, convalescents may carry about with

them, probably on the pharyngeal or nasal lining, germs which may cause the disease in a far more serious form than that from which they have so happily recovered. As to what the length of the quarantine should be I cannot say definitely, but I would insist on forty-two days. It has been suggestively remarked that there is as much diphtheria out of bed as in bed, and nearly as much out of doors as indoors. The tonsils may long remain swollen, and their dilated crypts may contain diphtheritic membrane which, at this stage of the disease, if seen for the first time, might suggest simple follicular tonsillitis. In the case of a child at school having been the subject of diphtheria, I would oppose his being sent back among his little companions for at least two months.

PART II.

Acute catarrhal laryngitis.—Croup, let it be repeated, is but a symptom of a disease, and it occurs in two forms of laryngitis: in the inflammation of diphtheria, and in the acute laryngitis which may come on after a child has been exposed to wet or cold. In the preceding paragraphs the two kinds of laryngitis have been described together. The practitioner is no more able to disassociate them on paper than, in early cases, he can at the bed-side. In diphtheritic laryngitis an exudation membrane is formed; in the acute catarrhal form it may not be. This latter disease is of frequent occurrence; it is not infectious. But who can venture to say that an attack of acute laryngitis is of the non-infectious variety? If a child happily recover from an attack of membranous (diphtheritic) laryngitis, its true nature may possibly escape recognition, unless it have occurred in association with other cases. Some cases of diphtheritic croup begin as an ordinary laryngitis, diphtheritic inflammation supervening. Without seeing

patches upon the fauces, it may be impossible to affirm that a laryngitis is diphtheritic, though, if it occur in an epidemic, there can be little doubt as to its nature. In each case the voice is harsh and rasping, and steadily decreases in force; the child speaks with pain, and has evident difficulty in swallowing. In acute catarrhal laryngitis the inflammation does not descend into the trachea and bronchi; there is no enlargement of the lymphatic glands, nor is there albuminuria; these features may, however, be absent in unmistakable diphtheria.

The reason why "croup" is described as less infectious than diphtheria is because the virulent, diphtheritic variety of the disease is apt to be reckoned in the table of statistics together with cases of acute catarrhal laryngitis. The latter disease comes on suddenly, and gives the good figures for tracheotomy. These are the cases, also, which occur after the floor-scrubbings of the Saturday afternoons; but even in them there may be some exudation membrane in the larynx. It is a good plan to suspect diphtheria in every case of "croup." Time will, in all probability, make the diagnosis clear; and if the precautions which were adopted prove to have been superfluous, so much the better.

It would be very rash to affirm that an acute laryngitis is not diphtheria, even after the rapid establishment of convalescence. On the other hand, when on the tonsils of the child with the croup-symptom grey patches are found; when the child rapidly sinks, even in spite of tracheotomy; or when the croup-symptom occurs in an epidemic of croup, diphtheria, or scarlet fever, the identity of the virulent disease is only too evident.

Treatment will correspond in most particulars with that advocated above. If one could say for certain that the laryngitis is not diphtheritic, strict isolation

of the child would not be so urgently demanded ; but this is often impossible. An apparently clear case of acute catarrhal laryngitis may show its nature by conveying infection when convalescence has set in. Amongst the most valuable remedies are calomel ; emetic doses of ipecacuanha ; hot, moist compresses, and leeches.

Chronic laryngitis, which is often the result of congenital syphilis, renders the voice rough and harsh, and impedes respiration : it may give rise also to an irritating cough. Expiration, as well as inspiration, is prolonged. The attacks of dyspnœa are liable to periodical and serious exacerbations ; especially are they apt to come on at night, when the cough may have something of the peculiar metallic ring of croup. Niemeyer remarks that it is thus that we hear so often of children who have suffered eight, ten, or even more attacks of "croupous" laryngitis. Running from the nose may be taken as evidence that the laryngeal trouble is of the simple catarrhal nature, and is, therefore, a good omen. We would offer the caution against shutting up children in the house, even though they have suffered from laryngitis. They should be kept in the open air. In bad weather they should be warmly clad, but the neck should not be heated with a thick comforter. The child should not talk loud, nor sing, and he should be instructed to moderate his cough. A couple of leeches placed over the trachea, counter-irritation, wet compresses, emetics, steam inhalation, medicated vapours, very small doses of morphia often repeated, iron and quinine, are all useful in various phases of the disease. If the dyspnœa become extreme, tracheotomy will be demanded ; the operation might also be performed for intractable laryngitis, so as to give the inflamed tissues about the glottis needful rest.

Laryngismus stridulus, or laryngeal asthma,

is a spasmodic affection of certain muscles about the glottis preventing the ingress of air. It is particularly apt to occur in weakly male children, and between the ages of two months and two years, especially in the rickety. The later it appears the less amenable is it, as a rule, to treatment. Frequently it is associated with tetany. The distress comes on without warning, the child waking up in the night in great alarm. It often appears with weaning, and seems to be directly caused by improper feeding. There is no fever, expectoration, or cough, the condition being probably the effect of some disturbance of the pneumogastric nerve or of its recurrent branch. The mucous membrane of the larynx being unaffected, the voice is not changed. Sometimes the attack is solitary, but it may be repeated at varying intervals; urine and fæces may be voided during a paroxysm.

At last the carbonic acid intoxication caused by the spasm renders the reflex centres torpid; thereupon the contraction yields, and the breathing becomes calm again. In those instances in which the spasm is associated with convulsions, the prospect is serious, and the case may end fatally. Probably this is not an infrequent cause of sudden death in weakly infants, who, it has been supposed, have been overlaid.

The *diagnosis* rests chiefly on the facts that the attack comes on suddenly and without elevation of temperature; and that, having passed off, the infant resumes its normal aspect, the air coursing easily and quietly through the glottis; and that the cry or the voice is unaffected when the attack is over.

Treatment.—The condition of the alimentary canal and of the gums should be inquired into, and special care should be given to the matter of feeding. If the disease be indeed a neurosis of the pneumogastric, its dependence on indigestible food is intelligible. The child is most likely rickety; the diathesis,

therefore, must receive special attention. It is said that hand-fed infants are more liable to it than those brought up at the breast, and this is certainly my experience.

Tonics are needed, and occasional doses of rhubarb and soda ; counter-irritation is of doubtful value, and the atmosphere of a hot room is depressing. Ringer advises that the infant be sponged over several times a day with cold water, for the sake of the tonic effect, and that he be taken out of doors daily, no matter how cold the air may be. If, however, a child be liable to bronchitis, he should be kept indoors when the weather is very severe, being sponged with cold water nevertheless. When the child cannot be taken out of doors the air of the rooms in which he lives must be always kept fresh by thorough ventilation.

The drugs most useful are those directed against rickets and struma. If the infant be unconscious, convulsed, or cyanosed, he may be placed in a warm foot-bath, while cold affusions are used for his head and neck. After the bath he may be found to breathe better sitting. Bromide of potassium can be given in rather large doses : four grains morning and evening, gradually increased to eight grains, and with this small doses of chloral may be combined. The inhalation of a little vapour of chloroform will prove serviceable if the attacks of spasm are severe.

Artificial respiration.—If, after a crisis, the child be found apparently dead, the medical man should at once set about the performance of artificial respiration by slow, alternating pressure of the hand, and relaxation, upon the chest walls. No case should be left without a trial of this measure.

CHAPTER III.

TRACHEOTOMY AND THYROTOMY.

TRACHEOTOMY is likely to be one of the first operations the young practitioner is called upon to perform. It is often demanded after daylight, and when skilled assistance is out of reach. The operator may consider himself fortunate if he have a friend to administer chloroform and to lend a hand with sponge or hook, and a nurse to hold a candle. Even with the most competent surgeon, the operation does not always go smoothly; but one must meet difficulties with equanimity, and doggedly proceed to open the trachea and insert the tube. Even if the chloroformist exclaim, when the operation is but half-way through, that the child is dead, the surgeon should not be disconcerted; the tube *must* be introduced. Tracheotomy must always be completed, even though the child be apparently dead upon the table.

Statistics are of no avail in the **appreciation** of this operation; each case is to be treated on its merits. If a child be writhing in the agony of dyspnoea, or lying exhausted under the physical exertion of fruitless attempts to inflate the lungs, the trachea must be opened. The unhappy parents are greatly to be pitied in these circumstances. Suddenly overwhelmed with despair, they may be unable to consent to, and unwilling to forbid a procedure which, after all, holds forth a somewhat slender prospect of recovery. It is then for the practitioner gently and persuasively to show that the child must not be allowed to die of sheer suffocation, and that the only chance of bringing him through even the immediate crisis, is by admitting air into the wind-pipe below the obstruction. And who can tell but that this individual case may be one

of those happy few which are rescued by operation? When the face is blue and clammy, when the eyes are turned up, and the child is, to all appearance, in the jaws of death, the admission of air after tracheotomy (with artificial respiration if need be) may be the means of causing a return of colour to the cheeks, of restoring consciousness, and of stimulating the enfeebled heart to fresh endeavours. The child is never so near death from the exhaustion of dyspnœa that it is not worth while to operate. Tracheotomy will always give a chance, and it may be the means of rescuing the child even when hope has been well-nigh extinguished; perhaps one child in every three or four may be saved by the operation, whilst the chances of the procedure hurrying on a fatal termination are so small, as to be scarcely worthy of consideration when the operation is in contemplation. Tracheotomy is a delicate, rather than a difficult or dangerous operation. It is unfair to regard it as a last resource; it is an invaluable therapeutic measure.

As soon, then, as the larynx is implicated, the instruments should be in readiness, though possibly they will not be required. The breathing must be carefully watched, and if the difficulty be increasing, if the child be losing colour, or getting restless, he should at once be afforded the relief which tracheotomy alone is able to afford. Among indications for operating, too much attention must not be given to the partial collapse of the chest in a small, rickety child, for with even slight dyspnœa in such a case there is a considerable and unimportant depression in the root of the neck and in the epigastrium.

When is the operation needed?—The answer is simple: "When an insufficient amount of air is entering the lungs." The signs of this are a sinking in of the supraclavicular, suprasternal, and epigastric regions during inspiration, and a harsh or

noisy passage of the air through the glottis. Further evidence of serious obstruction is prolonged and noisy expiration. If there be a doubt as to whether the operation may not be still further delayed, it will generally be better to **perform it forthwith**. When more exhausted, the child will be less likely to benefit from the introduction of the tube. Many a case is lost from tracheotomy having been delayed. At any rate, the operation will not prejudice the child's chance.

When the dyspnoea is increasing, however, it is a bad omen for the success of the contemplated operation if the jugular and epigastric regions do not markedly fall in with each inspiration; this shows that the lungs are already a good deal sodden and that the energetic inspiratory effort is failing to produce a partial vacuum.

Anæsthetics.—Except in those rare and urgent cases where time does not permit of it, chloroform should always be administered. If the child be frightened, he may be “put to sleep” before being taken from the cot. The chloroform may be administered on a handkerchief, a few drops being sprinkled on it to begin with; only a small quantity will be required. If the child be unconscious, or moribund, one operates forthwith, possibly the only instruments at hand being a penknife and a swan-quill. I have never seen harm follow the use of the anæsthetic, and its administration is a great comfort to all concerned.

The **instruments and material required** are: Chloroform, sharp scalpel, two pairs of dissecting forceps, several pairs of pressure forceps, steel director, scissors, sharp hook, simple dilator, various silver-plated tubes, a few ligatures, needle and suture, small sponges, feathers, and tape. These should be kept together, so as to be obtainable at a moment's

notice. Brandy, and a syringe for its subcutaneous injection, and vaseline, should also be in readiness.

Operation.—The low chest of drawers or table on which the child is to be placed should be in the best light obtainable, against a window, or under the gas. If the operation be done after daylight it will be well to have a supply of lamps or candles placed about. In a small room, with a single gas-jet from the middle of the ceiling, it will be advisable to have the neck of the patient almost under it, and to stick pieces of candle upon the mantel-piece, book-shelf, or elsewhere, by planting them upon a little of the melted tallow or composition. Excellent illumination may thus be secured. Long candles may be cut in two, and each half used. Unskilled assistants are of little or no use at a tracheotomy; they are apt to turn faint. The trunk and limbs being wrapped around with a thin blanket, the child should be placed with his shoulders lying on a small, firm pillow, and the head thrown back, so as to draw up the trachea from behind the sternum. The surgeon stands at the child's right shoulder.

The **landmarks** are the thyroid and cricoid cartilages, the trachea, and the episternal notch. In a small, fat-necked child it is not always easy to feel the trachea. It is very necessary to keep the head squared, and the incision in the median line. The deep part of the incision should be as long as the skin wound; a tapering, conical wound leads to difficulties. The incision will be from one and a half to two inches long, and an important point is to keep it high up, beginning over the thyroid cartilage. If it be made farther down the neck, the trachea will be sought where it is deeply placed, and in a dangerous area.

The trachea is opened in the highest rings, the cricoid cartilage being cut through, if expedient. If the wound made in the trachea be found of insufficient

length, it must be enlarged upwards, not downwards. Below the level of the isthmus the veins are fuller. One need not fear the isthmus, but, tearing through everything with two pairs of forceps, the wind-pipe is at last exposed to the extent of the width of the top of the left index finger, which is being used as a guide. The isthmus is perchance divided. The subcutaneous and deeper tissues should, so far as is possible, be torn through rather than cut, so that there may be less bleeding. For this, two pairs of dissecting forceps may be advantageously used. There must be no hurry during the operation, bleeding vessels being secured with the torsion-pressure forceps, and the trachea actually exposed before it is opened. If the trachea cannot be made clearly visible (as may happen if the wound be deep or there be much bleeding), at least it must feel bare to the tip of the finger.



Fig. 1.—Self-holding Forceps.

If attempt be made to open it while it is still covered with muscle or aponeurosis, disappointment and vexatious delay ensue. Swollen veins which are in the way may be caught with two pairs of forceps (Fig. 1), and then severed. A few pairs of these forceps are of great help ; with them the wound can effectually be kept dry without perpetual sponging, and any irregular or large vessel can be quickly secured by them. But the welling-up of dark venous blood which occurs in the deeper part of the dissection must be disregarded ; it ceases immediately the trachea is opened and the entrance of air has once more freed the pulmonary circulation.

When the wind-pipe is exposed, a sharp hook is

thrust into it, to fix it at about the level of the cricoid, and the point of the scalpel is then plunged in from below upwards. The edge of the blade is directed forward, and as many rings are divided as may seem necessary for the introduction of the tube. The surgeon should assure himself by the touch that the hook is firmly in the wind-pipe ; of this there must be no doubt. It has been recommended that the hook be passed into the trachea at a little distance from the middle line, its point being made to come out again through the tracheal wound. It is better, however, in this, as in every step of the operation, to keep exactly in the median line. The importance of exposing the trachea before opening it, is due to the



Fig. 2 —Tracheal Wound Dilator.

fact that there are strong fasciæ as well as flat muscles in front of it, and that it is very easy to slit the fascia instead of the trachea, and then to thrust down the tube between the fascia and the trachea, with the result of still further impeding the intake of air.

As soon as the trachea is opened, air bubbles up through the mucus and blood, and the anxiety of the operator begins to diminish. Forthwith the dilator is passed into the wound ; the blades are separated ; the child chokes, and coughs blood and mucus ; the tube is introduced between the blades of the dilator ; the spasmodic respiration quiets down, air passes through the tube, and breathing is so peaceful (such a change after the late noisy respiration) that a stranger to the process might think that the quiet betokened death. Colour returns to the face. The pulse improves. Thick mucus is driven into the tube, and

is removed by a feather or a camel-hair pencil. Shreds of false membrane are perhaps toughed out or extracted with forceps.

The thermo-cautery is not suited for the operation ; it makes the wound so hot, and its edges so hard, that the finger cannot be used as a guide, and the resulting eschars may be cast off with serious hæmorrhage.

The **tube** which best answers the various requisites is of metal, and consists of an outer and an inner part. The outer part has two lateral limbs, and must be securely made. This outer tube is introduced by itself, the limbs being pressed together, so that the thin, flat end easily slips in between the blades of the dilator, even if the tracheal wound be small. A round-ended tube is apt to compress the trachea without entering it.



Fig. 3.—Method of Securing the Tube.

The tube must not be too large nor too much curved forward. With the latter fault, pressure might bear against the front of the trachea, with, possibly, fatal complications. The tube need not completely fill the trachea. A useful size and shape is that shown in Fig. 3. It is large enough when it admits the air without noise. For small children, the lumen of the outer tube, at the level of the plate, may be of about the size of an ordinary steel-pen holder, and, for larger children, of the size of a cedar pencil. To the surgeon who is not in the habit of choosing tracheotomy tubes this simple gauge, though laying no claim to accuracy, will be found not without value. It is well to keep several intermediate sizes in readiness.

The tube tapers gradually from the plate. If the

neck be swollen from diphtheritic inflammation, it will be necessary to have a long tube. Unless the inner tube be longer than the outer, the end of the latter may become blocked. If required, a suture may be applied at the ends of the skin wound. I much prefer the bivalve tube to the square-ended tube, which has to be introduced by means of a "pilot." The former slips in far more easily, and through a smaller aperture.

Different surgeons prefer tubes of different shapes, and are apt to see grave errors in such as they have not designed, or successfully employed. Having neither invented nor modified a tube, I am possibly without bias in the matter; at any rate, I recommend one which is in very general use, and which, as figured above, is simple, convenient, and efficient.

Recognising the tubular nature of the trachea, Pancoast and others maintain that the tracheal wound should be kept open without the descending internal tube. But while fully recognising the many disadvantages attending the use of the tracheotomy-tube, I do not yet see my way to dispensing with it. Without doubt, a handy and trustworthy substitute for the tube is much to be desired. After a metal tube has been in use for some time, it should be carefully inspected, as it is apt to get disjointed. (For soft tubes *see* page 54.)

Tying in.—When the breathing has settled down, the tapes are adjusted. There should be a tape for each side, and they should be long enough to be tied in a double bow at the hinder part of the neck. The tape should be narrow enough to run easily through the slit in the tube-plate, and, being pointed, it may conveniently be threaded through the plate as it rests upon the skin of the neck. A slit about half an inch long should have been cut in the middle line of the tape, near the end to be threaded, and the running

end afterwards drawn through it, as shown in Fig. 3. But until the tapes are securely fastened, a finger should be kept on the plate of the tube to prevent its being forced out of place by a cough. A piece of lint, appropriately notched, should be covered with vaseline and spread between the shield of the tube and the skin. It may be changed every few hours. A piece of gauze, dipped in a lotion of sanitas or carbolic acid, may be lightly placed across the opening of the tube and the front of the neck, as an antiseptic respirator. Before leaving the nurse in charge of the case, the surgeon should see her take out, cleanse, dry, lubricate, and re-insert the inner tube.

Clearing the wound of mucus and blood may be effected with small sponges. If the trachea itself be blocked, the mucus may be forced up to the surface-wound by sudden and firm compressions of the chest walls, and it can thus be caught and wiped away. Or a large ruffled feather may be pushed down the trachea, and, being twisted round, may entangle and draw out tenacious mucus, or cause it to be ejected through the wound by coughing. Shreds or tubular casts of false membrane may thus be fished up, and then caught at the wound by forceps.

Caution.—In standing over the child the surgeon runs great risk of infection, by the breath of the patient, or by the out-rush of air through the wound. This risk is run in the course of duty, and is scarcely heeded. But if, after the trachea is opened, the air do not pass through the wound freely enough to satisfy the surgeon, it is not his duty to put his lips to the wound, and endeavour to suck the parts clear of obstruction. This proceeding is neither lawful nor expedient. Sucking can be of no peculiar advantage. It may cleanse the surface of the wound of blood and mucus, so that the bubbling noise is diminished; but this could be done as effectually by a piece of sponge. It cannot

clear the trachea, because suction can be effected only under the influence of atmospheric pressure, and the lungs are a shut sac. Were the trachea open below, the act might avail much. Air locked in the bronchial tubes can hardly be possessed of sufficient expansive force to help the expulsion of mucus or membrane, even when a powerful suction is at work at the wound. But the surgeon is apt to lose sight of these facts when he sees his little patient failing to gain the relief which the operation was expected to bring. The intense anxiety which at this juncture he feels for the patient, for those to whom the young life is dear, and, let it be added, for the success of the operation itself, is apt to impel him forthwith to put his mouth to the wound. I am fully convinced of the futility of the act. It is as unsurgical as it is dangerous, and has caused the unavailing sacrifice of many an heroic life.

It has been suggested that the trachea may be cleared by a catheter passed down the wound, and fitted with an exhaust-ball. But even this scheme does not appear very practicable, and during a resort to it the tracheal wound remains blocked, and time is being lost. Reliance should be placed rather upon the effect of firm pressure over the chest to drive up fluid or shreds. By the help of a sponge the complete removal of the obstructing material may be better effected. But the introduction of a long primary feather may set the child coughing, or may more directly clear the trachea. By turning the feather round in the trachea, or even in a bronchus, a more thorough, effectual clearing of the wind-pipe can be obtained than by any other method.

On no account should small pieces of cotton-wool or sponge be introduced into the trachea, or even into the wound in the neck; they are apt to be carried adrift, and so to plug a bronchial tube. *Artificial respiration* should be resorted to on the conclusion of

the operation if breathing be not established. It should be persevered in for half-an-hour, or even more. By this means life may be restored after all hope has been given up (page 38).

Fallacies in the operation.—The skin wound may be too low and too short: the trachea may have been dragged aside, or not sufficiently incised, so that the tube (especially if it be a round-ended one) does not enter, but slips down in front of it. The trachea may be altogether missed if the dissection be not kept in the absolute middle line. If the wound in the trachea be made with a dull scalpel, and without a little plunge, the mucous lining may escape transfixion, the tube passing down between it and the tracheal wall. If air do not pass through the tube, either naturally or on compressing the chest, the chances are that the tube has not been passed into the trachea. If air cannot be made to flow, the tube must be quickly taken out, the dilator introduced, and the trachea exposed and explored. The tube may be blocked with mucus, or its aperture obstructed by false membrane. If the tracheal wound be open, search should be made for a membranous cast of the trachea, which might be drawn out by forceps. For thorough exploration, the tracheal wound should be enlarged slightly upwards, and a pair of forceps introduced. The occasion is critical, and fortunately is rarely encountered. Much more likely is it that the tube has been passed down amongst the ribbon muscles at the front of the trachea, than that its end is blocked by a membranous cast of the trachea.

I know of a case in which, from the wind-pipe having been twisted from its position, the tube was found *post mortem* to have been introduced into the trachea through the œsophagus; and of another in which the tube had been dashed right through the trachea and into the œsophagus.

Pugin Thornton has seen, at the *post-mortem* examination of a child, three cuts on the vertebral column, which had been made by a house-surgeon in fruitless attempts to open the trachea. Probably the unhappy operator first lost his landmarks, and then his head. He should have paused in the middle of the operation, sponged out the wound, secured bleeding vessels, and calmly felt with the tip of his left index finger for the trachea. To attempt to incise it before it is bared beneath the finger and secured by the hook, is reckless surgery. Nothing is gained by dash in the operation ; steadiness is everything. The surgeon who has operated on a fat-necked infant would have more sympathy with him who scarred those vertebræ than he who had no experience in the operation.

Tracheotomes. — Various ingenious instruments have been invented with the idea of simplifying tracheotomy : by the thrust of a double-bladed instrument the trachea was straightway to be opened ! But the blade is apt to compress, or to slip from off the movable trachea, or to go through both its walls, and into the œsophagus or vertebral column. The tracheotome is a dangerous instrument ; there is no royal road to the operation of tracheotomy.

The **prognosis**, when the operation is performed for laryngeal diphtheria, is highly unfavourable, the cause of death being exhaustion ; or the extension of the inflammatory process to the bronchi and lungs ; or blood-poisoning. Or death may be due to the paralysis of important muscles of respiration, or of the heart itself. The operation itself does not kill the patient, or even shorten his life. Let that be clearly understood. The child dies in spite of the operation, not from it.

In my experience, children with laryngeal diphtheria in private practice do not show nearly so good a percentage of recoveries after tracheotomy as do

those who, being at once taken to a hospital, are operated on at the first indication.

At the Hospital for Sick Children, Great Ormond Street, there have been, in a little less than five years, 66 cases of tracheotomy for laryngeal diphtheria, out of which number there have been 25 recoveries—a percentage of about 38. And at St. Mary's Hospital, during the last four years there have also been 66 cases (almost entirely amongst children); of these, 20 recovered, or about 30 per cent. In the total of 132 cases there have been 45 successful results, or a percentage of 34. I feel sure that if an equal number of tracheotomies in children with laryngeal diphtheria in private practice could be collected (not selected, as statistics too often are), the percentage of recoveries would not show nearly so favourably.

It is a bad sign when the introduction of the tube does not completely relieve the breathing, as in that case the false membrane has already reached the trachea or even the bronchi. It is a bad sign when the tube remains dry, or is merely caked with gluey mucus; when food escapes through the tube, as the muscles of the larynx being then paralysed, food will probably enter the lungs and set up "deglutition-pneumonia." The prognosis in infants and young children is especially bad, so also is it when the temperature persists above 102° F. It is bad when the membrane comes away in thick flakes. During certain epidemics hardly any children recover, in spite of the most skilful tracheotomy, and the most efficient after-treatment and nursing.

The child may be expected to recover when he swallows food and stimulants abundantly and well; when his temperature keeps down, and the tube discharges clear mucus freely; when his colour holds good, and he takes increasing interest in his toys, or in what is going on around him. But, as already

remarked, he is not "out of the wood" until convalescence has so far advanced as to place him beyond the risk of paralysis of cardiac and respiratory muscles.

The **sick-room**, cleared of all unnecessary hangings and furniture, should be kept at about 70° F. A bronchitis kettle should be gently at work. The cot should not be brought close up to the fire, nor should steam be directed upon it. The cot should not be made into a tent, as the hangings shut out the needful supply of fresh air, and are in the way of doctor and nurses. Thorough ventilation of the room by door or window is necessary, even at the expense of the temperature. A damp and stuffy atmosphere is highly prejudicial. The inspired air may be kept moist by laying a piece of gauze wetted with antiseptic lotion over the neck, as already mentioned.

The **after-treatment**.—The strength must be kept up with milk, egg-flip, wine, and quinine. But if the muscles of the glottis be affected with diphtheritic paralysis, or their action hindered, so that fluid enters the larynx, the child should no longer be fed by the mouth. If fluid food go the wrong way it may be found coming up through the tracheotomy tube, and mixed with frothy mucus. A very soft No. 8 male catheter should then be passed along the floor of the nares, through the pharynx, and into the stomach: through this the food can be administered by a glass syringe. But when a child is being fed in this way for any considerable time, the diet must not be exclusively of starchy and animal foods, lest by chance scurvy result. The juice of lemons, or of some other fresh fruit, should occasionally be given. The first drops of the fluid should be injected slowly, so that the surgeon may assure himself that the instrument has passed the right way. Peptonised enemata may also be used; one being given before the child is replaced in bed; quinine

may be taken suspended in milk ; and small pieces of ice may be put into the mouth to allay thirst.

The food is to be given in small quantities, and at short intervals, say of an hour and a-half, or two hours. The stomach should not be overloaded, lest vomiting supervene ; vomiting is a contingency to be dreaded ; and the subject of diphtheria cannot be expected to have either good appetite or power of digestion. Wine should be given with great freedom ; there is no drug or aliment of equal value to it. In addition to the foods mentioned above, Carnrick's beef peptonoids may be employed ; they contain the nutritive elements of the meat with the solid constituents of milk, and gluten. This food is prepared as one mixes mustard, in a cup, and is then diluted with hot water. If used as an enema, it should be given in a glass syringe, as it chokes the indiarubber apparatus. Benger's pancreatic food may be taken in milk with advantage, as it is readily absorbed by even a weak stomach.

The nurse should see, before the household retires to rest, that she has enough coal, methylated spirit for the spray, antiseptics, stimulants, ice, and food to last through the night ; and plenty of feathers and torn pieces of sponge for keeping the tube clear. It is unsafe to leave the child for a moment unattended. In private practice two skilled nurses are required, one for night and one for day, and they should both be in the room when the tube has to be taken out, or the child has to be disturbed for any other important matter.

There is an art in *clearing the tube* ;—when the child coughs, the scrap of sponge should not be held over the hole, but the nurse should wait until the cough has brought the thick mucus up to the mouth of the tube, then she should catch it, and prevent its being drawn down again. Every now and then a

medium-sized feather should be twisted round inside the tube, to ensure a free passage, especially if there be much mucus. After the operation, great responsibility rests with the nurses. They should be instructed in the art of clearing and cleaning the tube, and should have confidence for the removal of the inner tube for washing. Without the inner tube, the passage could not be kept clear; the use of an oiled feather makes it slip in and out more easily. But as harm may be done by the free use of a feather in the trachea, the nurse should not be allowed to resort to the practice lest spasmodic cough or tracheitis be set up; the surgeon also should be cautious with it.

In the early days after the tracheotomy there is so much viscid mucus that the inner tube is of great convenience. But when matters have quieted down, and the passage into the trachea is lined with granulations, a single tube may be substituted. Baker's indiarubber tubes may be used after the opening into the trachea is well established. They are not so convenient for introduction at the time of operation as is the flat, bivalve tube. Before insertion, the tube is soaked in hot water and lubricated with vaseline; oil should not be used. Its introduction may be facilitated by cutting the end obliquely, or by sending it down over a flexible catheter used as a guide; or it may be slipped in between the blades of the dilator. It gives no trouble; can be cleaned with a feather; and is unlikely to set up ulceration, necrosis of cartilage, or secondary hæmorrhage. It has no opening on its upper surface, but one can easily be made with a pair of scissors; when changing the tube a bivalve metal one must always be at hand, which may be slipped in should trouble arise; and the surgeon should never change a tube of any sort without having the dilator (Fig. 2) at hand.

No kind of tracheotomy tube can be worn for an

indefinite time without risk of deterioration ; it should be examined from time to time ; the soft tube is not trustworthy unless it is made on a foundation of canvas. Should part of a tube slip into the trachea, the case must be dealt with as directed in chap. xvii.

Solvents, etc.—It is highly problematical if any chemicals be known which have the power of dissolving the false membrane *in situ*. Experiments in the laboratory may give results such as clinical observation will entirely fail to endorse. A steam-spray will keep the air moist, and so afford valuable physiological assistance, and the addition of sanitas will give a more wholesome character to the atmosphere. If the nostrils be constantly running, or choked with discharge, a mild solution should be regularly used with a syringe for keeping the passage clear. For this purpose warm sanitas-water does well ; if any of it pass into the stomach it does not irritate.

Cellulitis.—The surface of the wound may take on a covering of diphtheritic membrane, though this is not of common occurrence. The skin and cellular tissue in the neighbourhood of the wound may become swollen, so that the tape around the neck requires alteration, and inflammation may end in suppuration or gangrene. It is likely, however, that the child will sink ere such changes ensue. The wound may be painted with glycerine and carbolic acid, and the neck coated over with flexible collodion, or the common white lead paint.

The **permanent removal of the tube** involves anxiety and patience. If the child do well, it may be taken out for an hour or two on the third, fourth, or fifth day ; but if there be spasm or dyspnoea, it must be slipped in again. The dilator should be at hand in case of difficulty occurring in the re-introduction. Before removing the tube, and to ascertain the condition of the glottis, a small piece of wet oil-silk

may be laid over the mouth of the tube. At each inspiration this film is sucked over the opening, and the air has to be drawn through the larynx. This frightens the child at first, but he soon gains confidence, and so prepares himself for breathing through the glottis. Or the inner tube may be removed, and the outer one blocked, so that air has to pass between the limbs of the outer tube and through the glottis; the blocked tube may be worn for several days or nights, if expedient. It may be many weeks, or months, before the tube can be omitted by night as well as by day; dyspnoea is always increased at night. If the child be very nervous the tube may be removed and the glottis exercised under chloroform. Impediments to removal of tube may arise from apprehensiveness on the part of the child, diphtheritic paralysis of the muscles of the glottis, blocking of the larynx by granulation, or adhesion between the vocal cords.* Such cases are difficult to manage; fortunately they are rare. Granulation tissue and adhesions may be broken down by passing a probe through the glottis from below, or it may be necessary to divide the cricoid and thyroid cartilages in the exact middle line, and, having cleared away the granulations, dried the surface, and touched it with a dull cautery, to suture the cartilage. The tube would be left undisturbed in the trachea for a few days subsequently. Or the communication through the glottis may be re-established by the use of slender sea-tangle tents, or of O'Dwyer's tubes (page 27). Indeed, O'Dwyer's tubes may prove of special service in the treatment of these troublesome cases.

Papillomata of the larynx may not be visible on laryngoscopic inspection, but by a process of exclusion their presence may be diagnosed almost with certainty. Parker had a case of this nature

* Thos. Smith; *Trans. Med.-Chirg. Soc.*, vol. xlviii.

in a child of four years, who had suffered for three-fourths of its life from laryngeal obstruction. There was insufficient voice for speech or cry ; finally, urgent dyspnœa ensued ; tracheotomy was performed, and warts appeared in the wound. The thyroid cartilage was laid open from the front, and the crop of warts cleared away. Recovery was complete, and voice was gradually developed. But, unfortunately, all cases do not prove so satisfactory ; it is always an anxious operation for the surgeon and a very serious ordeal for the child, the risks of hæmorrhage, pneumonia, and sepsis being great.

For **thyrotomy** a preliminary tracheotomy is performed, and a median incision is then made down to and through the thyroid cartilage and the cricothyroid membrane. In childhood the parts are so small that sufficient room will not be obtained unless the cricoid is also divided, but a little piece of the thyroid cartilage may be left undivided above so as to ensure the more exact adjustment of the alæ when the operation is completed. The surgeon proceeds slowly, securing each bleeding point, and taking care that no blood passes down by the side of the tracheotomy tube and into the trachea. The vegetations are scraped, seared, or snipped from the region of the glottis, with as little damage to the mucous membrane as possible, and the surface is then touched over with a saturated solution of chromic acid, to check oozing and to diminish the risk of the return of the growths. When the alæ of the thyroid cartilage have been accurately adjusted, the tracheal tube may be removed and the air-way through the larynx tested. Then or at any time subsequently the tube may be inserted if dyspnœa occur. The child will need careful watching lest respiration become suddenly embarrassed ; the dilator and the tube should be kept in readiness at the bed-side.

The operation is a straight-forward one, but does entail considerable risk both to the life and the voice. It should be performed before the child has become exhausted by dyspnœa, and when the evidence of papillomata in the larynx is clear, the surgeon should not wait for a fresh paroxysmal attack before operating, as it may be distressingly severe or even fatal. In the very young child there may be some difficulty in finding the lumen of the larynx, especially when the growths are abundant.

Thyrotomy may also be needed when circumstantial evidence of there being a foreign body impacted in the larynx is strong (page 240). After the operation the tracheal tube should be left in below the cricoid for a few days, lest dyspnœa suddenly occur from traumatic œdema at the glottis. There is less risk of bleeding in this operation than in tracheotomy, as the incision is higher in the neck and the veins are not usually engorged.

CHAPTER IV.

CERTAIN DIATHESSES.

HÆMOPHILIA.

THE hæmorrhagic diathesis is an inherited defect; several members of a family may be vitiated by it. A boy, with a constitution thus impaired, was under treatment for a small contused wound of the scalp; only after a prolonged trial of styptics, and compression, could the bleeding be arrested. A brother of this boy had bled to death from a scratch of the finger. Hæmophilia is a desperate complication in operative surgery; even such comparatively small matters as circumcision, the extraction of a tooth, the

bite of a leech, or the division of the *frænum linguæ*, may give rise to fatal hæmorrhage.

As a rule, it is not a first or a second outbreak of bleeding which causes fatal exhaustion, but the constant repetition of the attack. A boy may lose a large quantity of blood at a hæmophilic crisis, without a fatal result, and, after the bleeding has ceased, he may make rapid progress towards an uncertain recovery. The attack may come on without warning or definite cause, or it may be preceded by head-ache and malaise. Sometimes the blood flows from the mucous membrane of the nose, the rectum, or the bladder; the gum is a frequent site for spontaneous hæmorrhage; blood may ooze into the subcutaneous tissue, the intermuscular spaces, or the articulations, where large collections may be found. Such hæmorrhages differ from those of acute rickets by their frequent recurrence and characteristic associations. Reference has been made to umbilical hæmorrhage on page 276; blood may well up through apparently sound skin, and, unable to coagulate, may flow away in a full stream. It is always from many capillaries, rather than from a large vessel, that the bleeding takes place, and it is persistent rather than energetic.

If a surgeon knew that a child comes of a "bleeder" family, or has suffered from spontaneous hæmorrhage, he should decline to operate, except in the case of extreme urgency. If a cutting operation be demanded it may be expedient to perform it with the thermo-cautery. Abscess should be allowed to open spontaneously. Should the child grow up, the taint will probably render him ill fitted for the struggle for existence. Hæmophilia is more common in boys; but the girls of a "bleeder" family, though rarely themselves the subject of persistent hæmorrhage, may beget hæmophilic male children; indeed, this is almost to be looked for. If a girl be hæmophilic, she

may be the subject of serious loss of blood at the oncoming of menstruation.

A late house surgeon of mine, at St. Mary's Hospital, who has been worried from his childhood upwards by this diathesis, performed his duties constantly and efficiently, notwithstanding the occasional presence of a collection of blood in his knee joint or elbow.

Of the **pathology** nothing definite is known ; it may be a disease of blood, or of blood-vessels, or of both. All **treatment** is unsatisfactory. The child should be put to bed, and if the bleeding be from an extremity, the limb should be fixed to a splint. Neither suture nor cautery should be used, as this would almost certainly be followed by ulceration or sloughing, and so the bleeding might in the end be made worse. The spot may be dressed with dry cotton-wool secured with gentle pressure of strapping or bandage. Opium should be given in small and repeated doses, and the fact that "Ruspini's styptic" is a patent medicine need not preclude a trial being made of it. Iron and cod-liver oil may be given, and any drug or food which is likely to improve the general condition. Ergot and turpentine are highly spoken of also ; but no drug has yet been found of specific influence. The great point is to improve the constitutional condition. Fresh air, sunshine, cleanliness, and warmth, are of the utmost importance. If unusual vascular fulness give warning of an attack, the child may be treated by free purgation ; indeed, it is a most important matter to see that the bowels are never allowed to become confined. (Epistaxis, page 212.)

STRUMA AND TUBERCULOSIS.

The term "strumous," or "scrofulous," is a convenient one, but it has been so widely and variously

applied that difference of opinion exists as to its exact meaning. The adjective "strumous" used in connection with an inflammation of a lymphatic gland, a knee joint, or a conjunctiva, chiefly implies that the subject is of an unhealthy nature, either from inheritance or surroundings; but, further, that the attack is likely to run a lingering course, and possibly to end disastrously.

Though "struma is, perhaps, more frequently transmitted hereditarily than all other diseases together" (Savory), still the diathesis may be induced by over-crowding, improper and insufficient food, a lack of fresh air and sunlight, and a general neglect of hygiene. "Infants at the breast, supplied with good milk, and with plenty of it, seldom show any signs of strumous disorder; whereas as soon as they are weaned they become subject to various complaints of a strumous kind" (Watson). The feeding of infants who are born of strumous parents is a matter of prime importance, especially when the mother cannot suckle her child. "Strumous" inflammation is usually unassociated with much pain or redness; the skin is pale, bluish, or marbled. A great feature is that the inflammation is liable to be started by insignificant causes. Thus, a strumous boy sprains his knee, and the chronic or subacute synovitis which follows ends in total destruction of the joint. Another child is rapped on the wrist with a stick, and chronic abscess is the result; a third child suffers from an intractable periostitis of the tibia after a fall on the shin; and, in a fourth, ulcer or abscess refuses to yield to treatment. The strumous and tuberculous conditions may not be identical, though miliary tuberculosis often follows close upon the heels of, and, indeed, may be associated with, struma. The tuberculous diathesis is, generally, an outcome from the strumous. Thus, a child with strumous disease of the knee may rapidly sink from

the intercurrent of tubercular meningitis. Briefly, struma may be regarded as potential tuberculosis.

According to Koch, the virus of tubercle exists in the bacilli tuberculosis. His theory would be: that the bacilli, or their spores, enter the system by the lungs or alimentary canal. If the patient be predisposed to the reception of the poison, either from hereditary tendency, or an acquired condition, it may enter the blood, and lodge at some part weakened by injury or by previous disease, setting up the peculiar form of chronic inflammation.* These bacilli are, thus, harmless in the man with sound glands and joints; but when those tissues are below par (as after an attack of zymotic fever), to breathe the germ-laden air might be the cause of fearful disaster, or even of death. If this theory be a true one, it behoves the medical staff and attendants at a hospital for consumption, where bacilli must needs abound, to be sound in every tissue *cap-à-pié*. Again, if tuberculosis depend upon the presence of the bacilli, and if the bacilli be of that desperately malign nature with which they are discredited, how is it that so many children with tubercular disease of spine and joint completely recover under the simple treatment of rest and tonics? I think that Keetley is right when he says that tuberculosis tends to die a natural death, and that time can kill local tuberculosis unassisted by the surgeon. The misfortune is that it is so dilatory in the exercise of its healing powers, and that very often the patient or his joint, or both, are destroyed before the disease, but when vigorously helped by the surgeon, time wakes up, as it were.

Cheesy degeneration of inflammatory products is the starting point of tuberculosis; frequently, tubercular nodules are found in the cheesy glands of struma, where, before death, the presence of definite

* Marcus Beck, in the eighth edition of Erichsen's "Surgery."

tuberculosis had not been recognised. Strumous and tubercular inflammation specially attack lymphatic glands, bone, and synovial membrane. The trouble may come on quietly and painlessly, dragging its weary course, and but little influenced by treatment. For months or years tubercular deposits may remain quiescent, and then, under the influence of physical depression or local disturbance, may undergo suppuration. Caseation and subsequent drying up are a fortunate ending of the deposit. As a result of these processes, the presence of cretaceous nodules may mark the situation of demolished glands. Often when tubercular inflammation has ended in suppuration, and the complete evacuation of the abscess has taken place spontaneously or been procured by art, rapid healing occurs. Tubercular inflammation is by no means incurable; but that acute form of tuberculosis which is associated with the sprinkling of miliary deposits through the various organs is often accompanied with much constitutional distress, as shown by high temperature and extreme exhaustion. But even from general tubercular peritonitis a child may recover on the surgeon performing abdominal section, and irrigating and draining the peritoneal cavity, though at the time of operation it is seen to be dusted over with countless specks of tubercle.

Prognosis.—In favourable circumstances, strumous children will not only improve, but they may even shake off the effects of the diathesis. Under appropriate treatment the child with strumous or tubercular disease of the hip, spine, or other joint, may grow into a strong man or woman, and experience is daily showing us that the intractability of tubercular disease of joints has been exaggerated.

The **treatment** of struma and tuberculosis demands fresh, dry, warm air; sunshine; flannel clothing; plenty of good wholesome food; rest; warm washings

of the entire surface of the body ; gentle exercise, mental and physical, and cheerful surroundings. The circulation is slow, and after exposure to cold the fingers become chilled and livid ; cold bathing is prejudicial. Drugs to be tried are iron (in the form of tincture or iodide) and cod-liver oil, if the latter can be taken without nausea ; occasional doses of rhubarb and soda may be required. Cod-liver oil may be given with sardines, but where it cannot be kept down, cream and bacon form excellent substitutes. The oil must not be administered in large quantities ; half a teaspoonful twice a day after meals is a fair dose. Every now and then the oil may be left off for a few days or weeks, so that a dislike or disgust for it may pass away. Glycerine is not an equivalent for cod-liver oil. Oil may also be rubbed into the skin, when the child cannot take it by the stomach. Wine is not essential : spirits are actually harmful.

Such places as Rhyl, Broadstairs, and Margate are excellent for residence, especially in warm weather ; but in winter Bournemouth, Ramsgate, and Eastbourne would be preferable.

Strumous tubercle generally occurs in flabby, unhealthy-looking children. It may be that the child is being treated for some chronic affection of glands, bone, or joint, when the mother remarks that he has "something like a blind boil on his thigh." The nodules are often seen in the child who is the subject of strumous dactylitis. Sometimes there are several strumous tubercles in various stages of development in different parts of the body. The smallest of them feels like a fine shot-pellet in the skin ; there is neither tenderness nor discoloration about it. A further stage shows the tubercle larger, and nearer to the surface, and the skin around it hyperæmic or dusky. A deposit still more advanced is found as large as a bean or a dried raisin ; the spot being soft

or fluctuating, and the skin brownish or purple. Soon after this the thin skin gives way, and the unhealthy-looking sore which results slowly disappears, its situation being temporarily marked by a dusky staining. The best way to find the youngest of these tubercles is to smooth the hand carefully over the skin of the trunk and extremities. They probably consist of aggregations of leucocytes in a fluid, granular or slightly fibrillated blastema. At first they are quite hard. Being a cutaneous manifestation of struma, they are appropriately called also *scrofulo-dermata*.

Treatment.—If the child be dealt with on the scheme laid down in this chapter, they will disappear spontaneously, either by the contents being absorbed or by escaping to the surface. Simple dressings may be needed to keep off friction by the clothes. Incision and scraping must be resorted to if the nodules refuse to yield to general treatment, or if, having ulcerated, they do not promptly heal. Though secondary infection may be propagated by them, I do not consider that risk to be a serious one.

Strumous dactylitis is a rarifying osteitis of the phalanges, or metacarpal bones, in an unhealthy child. It may come on after a slight injury, but in many cases there is no clear history of the finger having been damaged. The bone is considerably swollen, its shell of compact tissue being occupied by reticular elements which are soft and sodden, and infiltrated with granulation tissue and pus. The skin of the affected digit is dusky and oedematous, and a ring of flabby granulations marks the opening of a sinus through which a probe may be passed into the strumous bone. (*Frontispiece*, Fig. 1.)

The **treatment** of strumous dactylitis demands care and patience; the disease is apt to get more surgical interference than is required. But if the finger be subjected to a small amount of compression in the

dressings, the hand being fixed on a splint and worn in a high sling, the case will probably do well. If subsequent progress prove unsatisfactory, and health appear to suffer from the presence of diseased bone, amputation can be resorted to ; but before proposing so drastic a measure the shell of bone should be scraped out, and dressed with iodoform, the hand being fixed on a splint. As the enlargement subsides, minute sequestra come away, the cloacæ disappear, and a useful though shortened digit results. Dactylitis of syphilitic origin readily yield to small doses of iodide of potassium. There are other characteristics of syphilis (page 81).

Strumous ulceration.—Cases of ulceration are met with in children, who, though not presenting characteristic features of struma, are not robust. Such ulcers are generally quiet and painless. Though sometimes surrounded by undermined and dusky edges, at other times they are covered with granulations, which, but for a want of energy, look promising. Healing is not influenced even by attention in the administration of drugs, the regulation of diet, and many and various applications ; or perhaps the sore may heal up for a while, and then break down again. Nothing short of a thorough scraping will avail, the edges being at the same time shaved away. If the sore be upon an extremity, a splint must be applied to the limb, so that perfect rest may be ensured.

Tubercular meningitis or acute hydrocephalus, is apt to supervene in the progress of a surgical case, rendering the prognosis desperately unfavourable. The child may not perhaps have been strumous, and, moreover, may never have given evidence of tubercular taint ; but when the health and strength have been undermined by chronic supuration, or lingering disease of spine or joint, a

highly suitable material is afforded for tubercular deposit; and sometimes when a tedious surgical trouble seems to have passed away, death results from tuberculosis.

The **symptoms** may be at first obscure. The child cares less for food; he vomits, loses flesh, and is drowsy. He may ask to be taken to bed two or three times in a day. He complains of great headache, and puts his hand up to his head; he is restless, and his pale face is every now and then covered with a bright flush. By drawing the finger nail in a slight scratch across the skin of the abdomen, a wide red streak appears (*tache cérébrale*); the abdominal wall is depressed. He grinds his teeth during sleep, and wakes up with a scream. He dreads the light, and turns over in bed to avoid disturbance. The eyebrows are knit, and the expression is anxious; the head may be hot. The child utters a short, sharp cry, and may call, "My head! my head!" The pulse is quickened, and the temperature raised. The fontanelle may be bulging; he may temporarily rally. Then drowsiness yields to delirium, the pulse becomes irregular, weak, and flickering. The pupils may be evenly contracted, or differing, and often the child squints. At any period of the disease convulsions may set in, and as the end approaches, coma is complete, the bladder and rectum being evacuated unconsciously. On ophthalmoscopic examination the retina is found congested, and tubercular deposits may be detected at the fundus.

Treatment and prognosis. — No treatment seems of avail when once the diagnosis of tubercular meningitis definitely declares itself. Mercury, iodide and bromide of potassium, anodynes, purgatives, and leeches; cold to the head, and blisters, have afforded but temporary relief. If the child be constantly sick it is useless to give medicines by the

mouth. When milk cannot be kept down, nutrient enemata may be administered ; but it is first expedient that the bowels be thoroughly cleared, either by a full dose of calomel and jalap, or by a simple enema. The room should be kept dark and quiet ; cold-water lint may be applied to the head. The bladder may require attention.

Rachitis.—Rickets depends on a general want of nutrition ; it is not simply a weakness of the bones. It is essentially an English disease ; practitioners from our colonies are astonished at the number of subjects in the out-patient department affected with it. (There were definite signs of rickets in about 30 per cent. of the children under my care in the out-patient department.) The disease abounds amongst the offspring of the London poor ; and those children who come last in a family are more apt to be rickety than the first. Exposed to similar prejudicial influences, some children will become strumous, others rickety ; probably some hereditary peculiarity determines the inclination to this or that disease. Rarely are tubercular children rickety ; hand-fed infants are much more liable to rickets than those who are suckled, especially if they have been reared on condensed milk or a farinaceous diet ; and even the children of well-to-do parents are apt in these circumstances to show signs of rickets. It appears improbable that rickets is closely associated with, or dependent upon, syphilis, for the first children of syphilitic parents show clearest signs of syphilis, whilst the contrary holds with regard to rickets.

One of the earliest **symptoms** is a restlessness at night, and a kicking off of the bed-clothes. Many rickety children perspire freely during sleep, so that the pillow is wet ; but if a child kick off all the clothes he becomes chilled, and then perspiration does not occur. Thus is explained the frequency of

the occurrence of bronchitis and acute pneumonia in rickety children.

It is not clear why rickety children kick off the clothes. It has been suggested that it is because the body is tender, and cannot tolerate the least pressure ; but the rickety child is not so tender as this would imply. Some writers have suggested that the thickening about the extremity of the long bone is of the nature of inflammation of the epiphysial cartilage and the periosteum ; but if this were so, one could scarcely handle the enlarged wrist, or press over the beaded ribs without causing pain. In the general run of cases there is no definite tenderness ; the child is feeble, helpless, and fretful, but not in pain. He is usually backward, and tumbles about, or crawls, at an age when he ought to be able to walk securely. As Eustace Smith remarks, a healthy child delights in movement, a rickety child is happy only when at rest.

The **head** is expanded, the forehead large, and the face puny. The borders of the parietal bones are swollen, so that the sagittal suture is thickened ; but ossification is so delayed that the anterior fontanelle, which should be closed before the end of the second year, remains wide open months later. The thickening of the parietal bones may produce a definite, though shallow furrow along the sagittal suture. The occiput may be found flattened if it be constantly resting upon the pillow, and on the nurse's arm. And either from the pressure of the brain from within, from absorption, or from retarded ossification, a thinning of certain parts of the parietal and occipital bones is produced (**cranio-tabes**). (See also page 81.) The soft spots may be detected by pinching the postero-lateral parts of the head between the finger and thumb ; it is as if the bones had been patched with a piece of parchment. The condition is found chiefly during

cradle-life, and is thus an early manifestation of rickets.

The milk-teeth. — When rickets appears in early infancy, the eruption of the incisor teeth may be delayed. If the disease appear after the cutting of the incisors the eruption of the molars may be retarded. A case has been recorded in which a rickety child of nearly two years had cut but four teeth. The alveolar process of the lower jaw, under the influence of the pressure of the lips, is occasionally repressed so that the teeth slope backwards.

The **bones of a rickety child** are deficient in earthy matter, and yield to superimposed pressure. The femur, tibia, and fibula bend either in the direction of their natural curves, or in other ways. If the child content himself with crawling, the bones of the arm may be deformed. The spine bends in a hoop curve, and may be so weak that the head hangs down upon the chest. Want of nutrition affects the development of the bones, so that the rickety youth is generally stunted as well as bandy or knock-kneed.

The **ribs** yield under atmospheric pressure, so that the child becomes pigeon-breasted. This deformity consists in the lateral compression of the chest walls, at about the junction of the ribs with their cartilages. (See page 101.) The anterior extremity of each rib and the adjoining piece of costal cartilage are expanded, so that a series of "beads" suggests the term "rickety rosary." A child may be rachitic without presenting this sign, the expansion of the end of the rib being almost entirely on the pleural aspect.

The **pelvic bones** become crumpled up, and especially so if the weight received by them be increased by the weak spine being fitted with a steel "support." Sometimes one finds the humerus curved from the mere contraction of the deltoid. But the child may grow out of all these deformities, provided



only that he be kept lying down until his skeleton is more strongly developed, due attention being paid to matters of general hygiene. It may be advisable to submit the bones of the fore-arm to gentle compression on a splint if they are bent by the child crawling.

The defects consist in proliferation of the cartilage of the epiphysis, and of the periosteum, which are the sources of the normal growth of the bones in length and in thickness. The cartilaginous and fibrous tissues resulting from this proliferation ossify more incompletely; the deep layer of the periosteum at the end of the bone is found thickened and abnormally vascular, and its soft tissues showing little inclination towards ossification. The cells of the epiphysial cartilage are formed in vast numbers; they are swollen, and heaped through the matrix without histological order. Thus the extremities of the long bones are expanded, especially the carpal ends of the radius and ulna, the tibia and fibula being affected in a less degree. When the extremity of the radius is much expanded, the wrist looks as if it possessed an articulation above the swelling as well as below it; and the child is then described by the mother as "double-jointed." Unless the rickety diathesis be effaced at a tolerably early period, a definite trace of the enlargement of the end of the radius will be distinguishable through adult life.

The **abdomen** is enlarged and widened, even up under the false ribs. This is not generally due to increase in size of liver or mesenteric glands, but to distension of the intestines, for there is resonance on percussion. The prominent abdomen, and the chest compressed from side to side, are characteristic of the disease. (*See Plate II.*) The motions are irregular and offensive; and the gas evolved by fermentation of the food causes the alimentary canal to be inflated.

Median furrow.—One feature in connection with the tumid abdomen is that the linea alba yields,

and becomes frayed out. The straight muscles of the abdomen are then thrust from each other, under the constant pressure from within the cavity, till at last a wide gap is left between them, from pubes to sternum. Through this gap the intestines bulge when the abdominal muscles are thrown into action, as in an attempt to sit up.

Treatment.—The child should be kept evenly dressed, and always warm, and the air and the food should be fresh. As regards drugs, reference may be made to page 64. The child must not be allowed to walk or sit until the bones and ligaments are strong enough to support the weight. He should be kept lying about, and should have his meals and toys upon the floor. The administration of phosphorus in minute doses has acquired considerable repute in the treatment of rickets and of the deformities resulting from it. The most convenient preparation of the drug is the *oleum phosphoratum*, in doses of from one to six minims.

Fœtal rickets is a name given to a condition occasionally observed in the new-born infant. The body of the rickety fœtus is rounded, and laden with fat; the belly is tumid; the limbs are stunted, and marked with transverse folds. The shafts of the long bones are short, thick, and bent, and the ends of the ribs beaded by the development of a cap of bone around the costal cartilage; the head is large. These infants may be regarded as belonging to a pronounced fœtal type of cretinism. They probably perish at or soon after birth. (Cretinism, page 173.)

Genuine rickets, with enlarged epiphyses and bending bones, may arise **in late childhood**; probably it is due to want of fresh food, fresh air, and exercise.

Rickets in adolescents makes its appearance at about puberty. It is an association of weak ankles

and flat feet, and albuminuria. Lucas attributes it to the effects of excessive masturbation. But several years after the subsidence of rickets there may be a recrudescence of the disease, when the usual deformities for the first time appear and then rapidly advance.

SCURVY AND RICKETS.

If an infant have been brought up on farinaceous food, or on condensed milk, or on the two combined, he is apt to become flabby, weak, and markedly rachitic.* A diet exclusively of bread-and-butter may induce the condition in an older child. The ribs will be beaded, the epiphyses swollen, and the head wet with perspiration; there is little or no elevation of temperature. The gums are spongy and swollen, and bleed at the least touch, and hæmorrhages take place into their substance, making them look as if bruised. If treated in time, the scurvy rickets may cease to advance, but if no improvement be effected in the hygiene, hæmorrhages may occur beneath the periosteum of the femur, tibia, or of other bone; into or beneath the skin, the conjunctiva, or other mucous membrane, or amongst the muscles. I have seen an enormous extravasation between the gastrocnemius and soleus, and in the case of an infant of eleven months there were capillary ecchymoses beneath each lower eyelid and into the scar of the vaccination wound; but I would here specially refer to the subject of *subperiosteal hæmorrhage*.

Such an infant lies uneasy, and is constantly moaning, and he cries out when the swollen limb is handled; the skin is glazed from tension beneath, and the limb appears paralysed, probably because it is too heavy or too painful for the child to move it.

* Trans. Path. Soc., 1883, by Barlow and Page; "Year-Book of Treatment," 1884.

The swelling, which has come on quite suddenly, extends around the limb, and gives no sign of fluctuation beneath. In certain rare instances the epiphysis is detached from the shaft. A fine canula and trocar thrust into the swelling find the bone bare, and on withdrawal of the trocar a drop or two of dark blood escapes, but no pus.

Treatment.—Recovery takes place under the influence of cleanliness, warmth, fresh milk, cod-liver oil, sweetened orange juice, and fresh vegetables. For the swollen limb, elevation, gentle massage, and dry compression will be expedient. Small doses of quinine and iron may be administered; no active surgical treatment is required. Under the improved hygiene, the blood clot is steadily absorbed; detached epiphyses again adhere to the shaft; the periosteum resumes its connection; the swelling of the limb disappears, and the child completely recovers.

CHAPTER V.

SYPHILIS.

SYPHILIS may be congenital or acquired. I have had under treatment a boy, of nine years, who had a Hunterian sore upon the prepuce, and condylomata at the anus; he had received contamination from a girl of the same age. When secondary symptoms appear upon a precocious child it will be well to make an examination of the lymphatic glands in the groin, and of the parts associated with them.

Inoculation may be received from a syphilitic wet nurse, from kissing a syphilitic child or other infected person; from an infected spoon or toy, or from careless vaccination. The primary induration may have

attracted little or no attention until the secondary symptoms appear. The course taken by acquired disease is like that seen in the adult. I have never met with a case of **vaccino-syphilis**. In England, where vaccination is performed with fair discretion, such cases very rarely occur; but should syphilis and cow-pox be inoculated together, the vaccine disease would have run its course, when the inoculation wounds become indurated and ulcerated, and the axillary glands enlarged. Further confirmatory evidence of syphilitic infection would be afforded after a few weeks, when roseola and other affections would appear.

In the case of **hereditary disease**, the taint may have been received from either parent, but when the disease has been recognised, it is the duty of the medical attendant to discover which of the parents is affected, and, if possible, not to allow further cohabitation until the secondary symptoms have entirely disappeared under treatment. When suspicion is strong, but no direct confirmation is to be found in the child, it may be well to question the mother as regards premature confinements, miscarriages, or still-births; to examine the brothers and sisters of the patient, and, if necessary, to have a private interview with the father. A syphilitic infant may be apparently healthy for some months after birth. It is not born with syphilitic eruption out on it; the symptoms rarely appear before the third or fourth week, and are found in greatest intensity about the third or fourth month. If treatment be delayed the infant may sink exhausted. A mother may give birth to a syphilitic child without having herself been infected. But such an infant should not be put to a wet-nurse, for though it cannot infect its mother, it can infect a healthy woman.

Symptoms.—The subject of congenital syphilis is apt to be of premature birth, and he may be a mere

bag of bones. At birth, however, a syphilitic child is usually strong and plump; gradual emaciation may suggest syphilis, even before any other symptom. The skin and the mucous membranes, generally, are the first to show signs of disease, but even in the early weeks of infancy an obstinate sleeplessness and fretfulness may suggest the presence of the taint. The sleeplessness may be the result of osteal pains. A moist roseolous eruption may be spread over the body, being most marked about the gluteal folds and the genitals, and sometimes the skin is raw in patches. An eczema which extends up the abdomen and down the lower parts of the thighs, that is, to beyond the region enclosed in napkins, may be of syphilitic origin; a non-syphilitic dermatitis seldom reaches below the middle of the thighs. The syphilitic eruption of early infancy may be papular, vesicular, pustular, or scaly, and several varieties may be out at the same time. They are not likely to appear before the infant is six weeks old; but even within a few days of birth a bullous eruption may break out and afford strong evidence of the disease; this infantile *pemphigus* involves a grave prognosis.

The epidermis is apt to be detached from the palms and soles either with or without the occurrence of vesicles or bullæ. This is almost pathognomonic of hereditary syphilis. Altogether, the skin of the infant has a dirty, muddy look, and falls in unwholesome wrinkles over the miserable trunk and limbs, and he looks prematurely old. The nails are ill-formed and friable, and pustular sores may be found upon the adjoining skin. It must be remembered, however, that though a child shows evidence of syphilis he may be plump and well-looking. And, further, because the father was known or suspected to be the subject of syphilis, it must not be illogically assumed that a rash upon his child is of that nature.

Dermatitis on the pelvic region of an infant is not necessarily of syphilitic origin, even when associated with a plentiful outbreak of papules and vesicles. Often it is due to the irritation of napkins saturated with urine or fæces, or which have been washed with soap or soda. The nates, thighs, and pudenda must be kept clean and dry, and napkins and towels should be soft, and should not be washed with soap or soda.

The **nasal mucous membrane** is in a condition of chronic inflammation and ulceration, so that there is constantly a thin or purulent discharge from the nostrils. This causes an impediment to the passage of air, and the infant is said to have "**snuffles**," *which may be the first sign to attract attention*. When the nares are blocked the infant can breathe only by the mouth, he cannot suck and breathe at the same time without snorting or suffocation, so he refuses the breast, and wastes rapidly. If the ulceration continue, blood may be mixed with the mucus, and the development of the nasal bones may be affected; or caries and necrosis may cause the roof of the nose to fall in. There may be bleeding fissures, ulcers, or condylomata, at the angles of the lips, which may heal with linear or general cicatrices (Fig. 22).

These lines are highly characteristic, as are also cracks and sores between the fingers and toes. Pain and bleeding attend stretching, and sucking and defæcation cause much distress, when the skin or mucous membrane is thus fissured. Small ulcers and condylomata may be found at the anus, and **condylomata** may appear about the scrotum and thighs; occasionally one sees them on the sides of the transverse dimples of the neck, thigh, and arm, and that even in well-developed, though syphilitic, children. Wherever condylomata are apt to appear, there also may be found raised "*mucous patches*;" their surface is moist, pearly grey, slate-coloured or dusky. They are

influence of mercury, the condition is well named *symphilitic pseudo-paralysis*. The limb should be secured by a well-padded splint.

Cases.—An infant was lately brought on account of some obscure trouble of the shoulder; she was restless, and seemed unable to move the arm; the shoulder was swollen and tender. There was no history of injury; the mother had previously had four miscarriages, all at the seventh month; this child, though born at full time, had “snuffles.” Syphilitic inflammation was suspected, but, in the absence of more direct evidence, a tentative treatment was adopted, with no resulting improvement, however. On a course of inunction the child at once improved, and the thickening and paralysis entirely disappeared.

In another case, the pseudo-paralysis was co-existent with cranial bosses and other signs of inherited syphilis; and, except for these manifestations, the enlargement at the ends of the long bones might possibly have been mistaken for rickets. But the ribs were not beaded; congenital syphilis, however, may co-exist with rickets.

Pseudo-paralysis must also be distinguished from infantile paralysis, a disease of somewhat later months, and one which is characterised by the suddenness of its onset. The neighbourhood of the joints is, however, sound in infantile paralysis, and the range of movement which can be imparted to the limb is not diminished. By the way in which the disease clears up under mercury, the diagnosis becomes absolute, should any doubt have existed.

I have seen few cases in which the dissolution of the junction cartilages has advanced so far as to complete the **separation of the epiphyses**. In some such cases crepitus might be obtained, but the epiphyses would unite again on the child being put under mercurial treatment. In one case of this

nature *post-mortem* examination showed the various articulations affected to be full of pus.

Diffuse osteitis may cause hypertrophy of the bones and sclerosis. A girl is now under treatment whose right tibia is thickened, and increased in length by one and a half inches. Gummata, necrosis, and caries have been associated in the same limb. The teeth are notched. The periosteum cannot long be inflamed without implication of the subjacent bone and of the junction cartilage; chronic disease of the periosteum and bone determine the increase in circumference, and of the cartilage, the increase in length. Various bones may be affected at the same time, and subperiosteal abscesses may quietly form and break, exposing a denuded surface of bone which, on account of the mildness of the local disturbance, is slow in exfoliating. The long bones may become curved in syphilitic hypertrophy. Thus, when the tibia alone is lengthened, the fibula holds its ends, and the tibia can lengthen only by bending. Caries necrotica often attacks these enlarged bones.

Gummata are met with in the later months or years of the disease. They may be situated within and beneath the skin or mucous membranes, or in connection with periosteum, bone, or lymphatic gland. The bone and periosteum may be swollen and tender from inflammation, without the occurrence of any gummatous deposit. Gummata may grow quietly, like a chronic abscess, and, being opened in error, or undergoing spontaneous evacuation, their situation is indicated by a deep excavation or dense cicatrix. I have met with such a gumma* in the thigh of a girl, five years of age, who had, at the same time, an ulceration extending through the soft palate, and deeply excavating the tonsil. She had become deaf on each side from syphilitic otitis.

* *Brit. Med. Journal*, 11 Jan., 1879.

Amyloid degeneration is apt to implicate the liver and spleen, which thus become considerably enlarged ; also the kidney, so that albumen is found in the urine.

Dactylitis, and the cutaneous tubercles which are often associated with it, were at one time thought to be the result of hereditary syphilis, but such association is frequently accidental. The fact of the finger getting well, and the cutaneous tubercles disappearing under the improved hygiene which accompanies the so-called anti-syphilitic treatment, is not evidence of the syphilitic diathesis. Nevertheless, when periostitis and gummata are affecting other bones in a syphilitic child (especially those which are more subcutaneous), the phalanges of the fingers and toes are apt to swell, and break down under the disintegrating osteitis, but there is, as a rule, less discoloration of the skin in the syphilitic variety than in the strumous. (Strumous dactylitis, page 65.)

Nodes may be found upon the long bones as well as upon the skull. They will vary in size with the general constitutional condition, and may undergo almost complete absorption. They are likely to be a late manifestation of the hereditary taint. Warmth and careful feeding, iodide of potassium, cod-liver oil and iron, together with an occasional course of mercurial inunction, help in promoting their disappearance.

Cranio-tabes has been alluded to in the chapter on rickets (page 69) ; but in connection with hereditary syphilis Elsässer, Barlow, and Lees have directed attention to an abnormal thinness of portions of the parietal and occipital bones, causing them to yield to moderate pressure, and to impart to a finger pressed upon them a sensation like that derived from stiff parchment, or from the surface of a bladder. These patches are probably the result of delayed ossification

of the skull walls, and their existence is not conclusive evidence of syphilis. They are often found in those who are neither syphilitic nor rickety, but simply ill-nourished. Certainly a great proportion of children with *cranio-tabes* are syphilitic. The thinning may be due to compression of the ossifying wall of the skull between the brain and the nurse's arm, or the pillow. It may occur only on the side upon which the infant is generally laid.

Cranial bosses have been described by M. Parrot as a proof of hereditary syphilis. They are



g. 4.—Frontal Bosses in a Syphilitic Child.

flat, bony elevations of the frontal and parietal bones at the corners of the anterior fontanelle; their presence is detected, if not by the eye, by running the hand over the skull. In some cases the masses are very prominent, and appear as sudden upheavals of the external table, so that the outline of the head is suggestive of a hot cross

bun; the head is often spoken of as *natif*orm (Fig. 4), on account of a distant resemblance to the nates. These osteophytes appear between the sixth and twelfth months. They are not exaggerations of the frontal and parietal eminences, but are the result of chronic periostitis around the fontanelle.

If **interstitial keratitis** take place, it will probably be when the child is between the ages of five and fifteen years, and it may be with or without iritis, more often without. A central haziness appears in the cornea, which may gradually extend towards the periphery. Thus the cornea looks like ground-glass, some parts of it being more flecked than others.

Sometimes the cornea is studded over with fine white dots, which remain separate, and each cornea may be implicated. These lesions may be unassociated with photophobia or lachrymation. It is surprising how, under mercurial treatment, the cloudiness fades away, though frequently a slight opacity persists. The pupillary border of the iris may remain irregular, from nodular deposits of lymph and from adhesions.

Deafness, which is not a common symptom of hereditary syphilis, may be the result of an inflammatory thickening of the middle ear or Eustachian tube, or of cicatrisation of ulcerations at the aperture of the tube. Or the loss of hearing may be due to an affection of the auditory nerve or its terminal filaments; such deafness is incurable. Deafness may come on with the corneitis, or may follow it at a distance.

The **voice** of a syphilitic infant may be faint, or harsh and unmusical, from chronic laryngitis. This may depend on condylomata about the cords, or on mere inflammatory oedema of the lining of the larynx. The cry of the syphilitic child is very characteristic.

The larger **joints** are apt to be attacked with a quiet synovitis about the time that the keratitis comes on; the effusion quickly disappears under the influence of mercury.

The **teeth of the permanent set**, especially the central incisors of the upper jaw, may exhibit characteristic notches; this pair Hutchinson calls the "test teeth" for hereditary syphilis (Fig. 5). They often "slant towards each other, are discoloured from defect of enamel, and each shows in its edge a broad notch." These, and the neighbouring teeth, may be dwarfed and unsymmetrical, and their corners rounded off. Sometimes the margin is occupied by small wart-like spines of dentine, which quickly wear away with use, leaving the notch conspicuous. The

lower teeth may be peg-like, or studded with excrescences. Sometimes only a lateral incisor, or a canine tooth is marked. These signs may be associated with keratitis. The imperfect and characteristic development of those teeth is due to the stomatitis which is likely to occur within a few months of birth, and as at this time the milk-teeth are already calcified they can exhibit no marked features of the disease. The milk-teeth are cut at about the usual periods, but they are often shed early. In the rickety child the eruption of the teeth is always delayed.



Fig. 5.—Syphilitic permanent Incisor Teeth.

“Bad teeth” are not evidence of syphilis; and because a child is the subject of hereditary taint the permanent teeth will not necessarily give evidence of it.

Mercurial teeth.—If during the development of the teeth the child be brought so fully under the influence of mercury that stomatitis occurs, the enamel may be found “defective, pitted, and discoloured.” This applies, of course, to the permanent set only, for the milk-teeth were formed long before.

Treatment.—The child should be warmly dressed and carefully and regularly fed, and he must not be exposed to cold or wet. Mercury improves his condition as by magic; whilst being brought under its influence he grows fat, wholesome, and contented. The drug is conveniently administered by the skin. A piece of blue ointment, of about the size of a bean, is placed upon a fold of flannel, and secured by a roller to the side of the child; the region for the inunction may be changed each day. Fresh ointment is put on the flannel every day, and every day the child should be washed all over with soap and warm water. This plan of treatment causes neither griping nor salivation. To treat the child by subcutaneous injections of

mercury would be objectionable, and by giving medicine only to the mother, impracticable.

If it be expedient that the real nature of the treatment adopted be concealed, one grain or two grains of grey powder may be administered in some coloured sugar twice a day. For many emaciated children, the inunction of the blue ointment with cod-liver oil, persistently carried out, is of great value. The cod-liver oil inunction is especially useful when an infant cannot derive proper supplies of nourishment from the breast, on account of the stuffiness in the nose. The treatment by inunction is continued for six or eight weeks, or longer if necessary ; but an unduly prolonged treatment causes anæmia and wasting, and interferes with the development of the permanent teeth. I do not remember ever to have seen a child salivated whilst under this treatment. The periodical weighing of the child is advisable. Sunshine and warmth are of much therapeutic value.

Condylomata and mucous patches may be dusted over with starch and calomel, and kept clean and dry. This dusting-powder may be used for the moist surfaces like toilet-powder. If the condylomata be at the verge of the anus, in the fold of the buttocks, or between the thigh and scrotum, the opposed surfaces must be separated by a small piece of absorbent cotton-wool, on which calomel has been dusted.

In later stages, especially if bones be involved in the disease, iodide of potassium in three-grain doses, taken in plenty of sweetened water, will prove of the greatest service. Foul discharges from the nose should be treated by frequent irrigation, or gentle syringing, the head being allowed to hang forward during the process. Calomel or iodoform dust may then be blown up the nostrils ; thus the thickening of the membrane and the muco-purulent discharge are

lessened, and the infant is enabled to suck and breathe at the same time.

Children are very frequently brought for further treatment on account of relapse, especially if instructions laid down on previous occasions have not been carried out ; but with prolonged and careful supervision the disease can be brought into complete and permanent subjection.

CHAPTER VI.

RACHITIC DEFORMITIES.

Genu valgum, or **knock-knee**, is common amongst rickety children, and unless attended to it is apt to persist, in even a more marked form, in adult life ; but, considering the number of valgous children which we see, and being fully aware of the imperfect way in which our instructions are usually carried out, it is surprising that the number of knock-kneed adults is not larger. The deduction is that feeble children grow out of their deformity ; but to leave the disfigurement unattended to, and to promise that the child will grow out of it, is to court disappointment.

Genu valgum is usually associated with, if not determined by a relaxation of the ligaments of the ankle and foot ; the knock-kneed child is generally flat-footed. The anatomy of knock-knee is more fully treated of elsewhere.* The tibia having lost much of its support at the inner ankle, the upper surface of its head receives the weight unevenly from the femoral condyles, the outer tuberosity getting more than its

* *Journal of Anatomy and Physiology*, 1879.

due share. This extra pressure causes some arrest of growth of the outer condyle of the femur, whilst, under the diminished pressure, the inner condyle grows abnormally. This elongation of the condyle is usually associated with an inward curve of the lower third of the femur which still further lowers the level of the internal condyle (Macewen). In some instances it is at the internal tuberosity of the tibia that the growth of bone takes place, with considerable thickening at the inner side of the epiphysial cartilage. Sometimes, indeed, a large irregular tubercle of bone is found just below the inner tuberosity of the tibia. This is due, in all probability, to the strain on the fibres of the internal lateral ligament causing irritation of the periosteum, from which a greatly increased blood-supply and an overgrowth of bone result.

The deformity is especially apt to be found in those who have been brought up on condensed milk or on a farinaceous diet, and who have been surrounded by a generally defective hygiene. Such children have a heavy trunk, and a large head, which the weak-jointed feet and legs are unable properly to support. The ligaments yielding, the distribution of the articular pressure is disturbed; when once started, the deformity increases rapidly. Heredity has, I think, but little direct influence on the condition, though parents of feeble constitutions,



Fig. 6.—Extreme Genu Valgum; from a photograph.

themselves valgus, are likely to beget weak-kneed children. An excessive amount of standing, or the carrying of heavy weights, has a prejudicial influence. Weakly children should not be allowed to carry about small brothers and sisters, nor help in the heavier matters of housework; nor should their stockings be suspended by an elastic band descending along the outer side of the knee.

Sometimes one leg is valgus, whilst the other is bandy. The explanation of this association is that the mother carries the child always on one arm, whilst she throws the other arm around the knees to make them fit into the hollow of her waist. Thus, if the child be carried always upon the left arm, the left leg will be valgus, whilst the right will be bowed.

In order to estimate the amount of deformity, the leg should be fully extended, so that the lateral ligaments of the joints may be tightened, and the tibia rigidly locked upon the femur. The patella, which is apt to be displaced over the external condyle, must be made to look directly upwards. For with but a little flexion of the joint, sufficient rotation and rocking of the head of the tibia may be obtained to efface all the valgus deformity. In most of these cases there is, at any rate at first, a considerable looseness of the joint. On the outside of the extended valgus knee, the thick fascial insertion of the tensor vaginæ femoris, and of the great glutæus, is evident along the front of the biceps tendon. This ilio-tibial band has no concern with the production of deformity. Other ligaments than those of knee and ankle are slack and inefficient; thus, abnormal movements may often be detected at the elbow and ankle.

To obtain a record of the amount of deformity, the child should be seated upon the table, with his legs fully extended, and the patellæ directed upwards. A

sheet of paper, large enough to reach from the ankles to above the knees, is placed beneath them, and by a pencil, held upright, a tracing of the limbs is taken. The distance between the ankles may be noted in inches.

Symptoms.—Even when deformity is but little marked, the child may complain of pains in the leg and knee, especially after much standing or exercise. Sometimes there is tenderness over the inner side of the knee; such pains are occasionally mistaken for chronic rheumatism; sometimes they are called “growing pains:” this is not, however, to offer an explanation for their occurrence. They are the result of strain of ligaments, and of pressure upon delicate bone tissue.

Treatment.—The child must be taken completely off his feet, and the improvement of his general health sought by the adoption of such means as are advised under the head of rickets (page 72). Apparatus should be supplied with a view to prevent, not to assist, the child walking. A splint tied along the leg of a child who is allowed to walk about is useless; irons are as inappropriate for little children as they are expensive. For a time the child may fret at being taken off his feet, but he soon submits with resignation. A plain wooden splint, padded on one surface, should be applied along the outer side of the limb; it should be long enough to reach from the top of the thigh to six inches beyond the foot. The limb is then braced firmly against the padded side of the splint, by wide webbing-straps and buckles, the strap which passes around the knee being drawn most tightly. The surfaces subjected to pressure should be carefully protected. The splint is

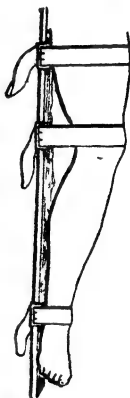


Fig. 7.

applied to keep the child from putting his foot to the ground until the bones and ligaments are strong enough to support the weight, and also that there may be a gentle and continuous pressure exerted against the lateral angle of the knee. Bandages of elastic webbing exert so much pressure that they cannot be trusted; they may cause ulceration. Every

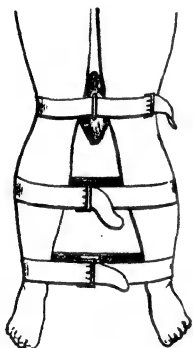


Fig. 8.—Simple Treatment of Double Knock-knee.

night, and occasionally in the day, the apparatus should be removed, and the feet and legs rubbed; and by judicious, firm, and repeated efforts, the parent or nurse should endeavour to straighten the extended limb. From time to time also the surgeon should manipulate the limb, and should satisfy himself that the nurse understands and efficiently carries out, instructions as to rubbing, kneading, and massage. (See also the treatment of bow-leg, page 100.)

If both limbs be slightly valgous, a firm, flat pillow may be fixed between the knees, and the ankles tied together by a handkerchief, or secured by a strap. This method should be carried on day and night, and to prevent any rotation of the tibiae, a sand-bag may be kept across the knees as the child lies; but if the deformity be extreme, or the improvement unsatisfactory, more vigorous measures may be demanded. The child must still be kept off his feet, and the limb secured in some form of trough splint, and submitted to greater straightening force by means of an arrangement of straps and buckles. Careful washing, rubbing, oiling, and padding will be needed to prevent the effects of chafing or pressure.

Or the gradual straightening may be effected by

an outside iron splint, the rod of which is fixed to the boot, and has an antero-posterior hinge at the ankle, and a lateral one at the knee. This latter hinge works with a rack and pinion. Every other day the surgeon straightens a little by the key. The strap which passes round the inner side of the limb should be carefully padded and adjusted, and on the slightest soreness must be removed (Fig. 9).

Operative measures. — If the child be young, and money be not forthcoming for an appropriate splint, or there be no one to look after the case, forcible straightening of the limb may possibly be admissible. One is told that the younger the child, the more satisfactory is the result of forcible straightening; but to this the rejoinder is, the younger the child the less the need for such rough handling.

The **forcible straightening** of the limb is effected when the child is under chloroform. The surgeon holds the thigh in one hand, and the middle of the leg in the other, and with his knee placed near or against the prominent angle of the extended knee of the child, he straightens it gently yet firmly, as he would a stick. Or the *redressement* of the limb may be effected against the mattress, or over a sand pillow. The limb is afterwards put up straight in splinting. It is impossible to say what happens during this manipulation; probably a condensation of tissue takes place about the inner side of the articulation. Sometimes, it may be, the external lateral ligaments yield, a gap being left between the external

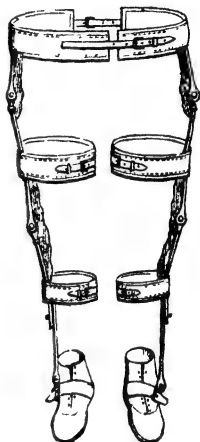


Fig. 9. — Mechanical Splint for Knock-knee.

condyle of the femur and the head of the tibia, and sometimes an epiphysial cartilage becomes partially detached.

There are, of course, various degrees to which the forcible straightening may be carried. It is by no means necessary to efface the lateral angle of the knee at a single operation. Indeed, by slighter and repeated operations, the risk of damaging the articulation (which, even with the bold interference, is very slight) may be practically disregarded. I have performed this operation in a large number of cases, and have never known the least trouble result from it, whilst, so far as I have been able to determine, the immediate and the ultimate results of the straightening have proved entirely satisfactory. It is almost needless to remark that this bloodless method of operating is not suitable for a child with large, strong bones, and that the limit of its applicability must be determined by the strength and solidity of the femur and tibia, rather than by the size and age of the patient.

(It is highly probable that when a young child has been subjected to osteotomy, and by the use of a certain amount of force the limb is put straight, the improvement is effected by *redressement forcé*, rather than by any advantage gained by an incomplete section of shaft or condyle.)

The cases in which **section of the biceps tendon**, the ilio-tibial band, or the external lateral ligament is required, must be rare. I should fear lest permanent weakness of the joints might result, and that the subject would have to wear for the rest of his life some special support. Indeed, I mention the operation only to condemn it.

Caution.—Although the operation for genu valgum is of but comparatively recent introduction (Annandale and Ogston began the treatment in 1875 and 1876 respectively), cases are now reckoned

by the hundred ; and though the Listerian method, in one form or another, has made the operation a comparatively safe one, and has emboldened the surgeon, still it must not be lightly undertaken. In connection with his fatal case, Mr. Barker, a conscientious Listerian surgeon, wrote,* " I have never observed such scrupulous care as in this operation ;" and in conclusion he states that the operation is dangerous. Doubtless, fatal cases occur more frequently than they are reported : for instance, I lost a miserable child the other day, on whom I had performed supracondylar osteotomy from the outer side ; and occasionally one hears of other mishaps. Death took place within forty-eight hours, probably either from fatty embolus or septicæmia. Hæmorrhage from the anastomotica magna, or some articular branch, or even from the popliteal artery itself, may cause anxiety and involve amputation, or even death. Suppuration may demand incision and drainage, and may be associated with pyæmia or necrosis. Lastly, the operation may give but partial improvement, relapse may quickly follow, or the joint (especially after section of the condyle) may be left stiff.

Advice to the osteotomist.—Operation being demanded, the surgeon will assure himself that the child is in a proper state for the ordeal ; that the urine is free from albumen, and that the temperature is not foretelling a coming storm ; that the throat is not sore, and that there is no scarlet fever about. The instruments, the part to be operated on, and the hands of the chief and of his assistants, should be clean. The bearings are to be carefully taken, and then, by a narrow-bladed scalpel, a course is cleared down to the bone for saw or osteotome. This incision is made in the length of the bone. If serious bleeding occur, the wound may require enlargement, so that the

* Transactions Clinical Society, 1878.

vessel may be secured. The progress of the osteotome is to be carefully watched; I have heard of an excellent and trustworthy surgeon driving the cutting edge right through the limb, and even into the sand pillow on which it rested. The osteotome is introduced upon the flat of the knife blade; when the bone is reached the scalpel is withdrawn, and the osteotome turned and steadily placed upon the spot selected. "Do this lightly, so as not to damage the periosteum. Hold handle of osteotome firmly in left hand, with ulnar border of that hand against the skin of the limb. When two-thirds of the bone is divided the rest can usually be broken. Never use osteotome as a lever to break bone. When both limbs are osteotomised, the first wound can be compressed by an antiseptic sponge and gauze bandage, while the other is being operated on. Use no drainage tube unless you expect danger of tension and suppuration."* If after the operation the toes become dusky, if blood or other discharge soak through the dressings, or if the temperature rise to 101° , the wound should be inspected. In a rickety child new cement cannot be trustworthy for several months; the operation can only improve the local, not the general condition. Retentive apparatus must be worn, and the child entirely kept off its feet for some months.

Ogston's operation.—Ogston, of Aberdeen, proposed to correct the deformity by a subcutaneous section of the inner femoral condyle (Fig. 10). By a narrow incision, leading obliquely to the trochlear surfaces of the femur, a course is prepared for the blade of an Adams' saw, and the condyle is cut off, the limb being then straightened, and the loosened condyle pushed up. This operation has now, however, given place to Macewen's, which has the great advantage of not implicating the joint itself.

* Keetley, "Index of Surgery," p. 296. 1884.

Reeves's operation is a slight modification of Ogston's. He uses the chisel instead of the saw, and is of opinion that by carefully limiting the amount of work done by the chisel and mallet, he can force up the internal condyle of the femur without opening the joint.

Macewen's operation consists in making an incision down to the diaphysis a little above the internal condyle, and partly cutting through the bone with mallet and osteotome. This latter instrument is of special temper, and is graduated so that the surgeon may correctly estimate the depth to which its cutting edge has penetrated. Its cutting edge is the same on either side, and is not like that of a chisel. From time to time, during the operation, an attempt may be made to straighten the femur by force, either by bending or breaking through the bone-tissue which has not been divided; the knee is supported on a moistened sand pillow. The incision down to the femur is made where a line, drawn transversely inwards at a finger's breadth above the top of the external condyle, joins a vertical one, which is half an inch in front of the tendon of the adductor magnus. The osteotome is slipped down to the bone by the side of the scalpel, which is then withdrawn, and the edge of the osteotome is turned at right angles to the length of the femur. When the second limb has (if necessary) been operated on, the wounds are covered with a pad of sublimate wool and a bandage, and the limbs are secured in the straight position by lateral splints of gypsum, which reach from ankle to hip. A second dressing is rarely needed.

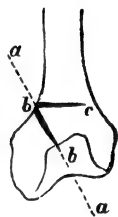


Fig 10.—a a, Line of Ogston's Incision, bb, Reeves's; b c, Macewen's.

A modification of Macewen's operation.—In those cases of knock-knee in which the bloodless

measures either offer no prospect of success, or have absolutely failed, osteotomy is, of course, the only alternative. But in performing this I have now entirely discarded the osteotome and mallet, preferring to make an incomplete section of the femur with a key-hole saw and then completing the fracture by force. Having "cleansed" the area of operation, I make a longitudinal three-quarter-inch incision on the outer side of the thigh a little above the condyle, clearing a passage for the narrow-bladed saw by a large raspator, with which also an endeavour is made to raise the periosteum. Along this instrument the saw is slipped, the femur being then sawn, so far as one can tell, about half or three-quarters of the way through. Sometimes, when the bone is very hard, the first attempt which is made of breaking the femur fails, and the saw has again to be introduced. If both limbs require operation, the second is treated before the first is permanently dressed; they are then fixed straight in a box-splint or in a Bavarian dressing. Of the objection to the presence of sawdust in the wound, we know nothing in practice, though in theory it is sometimes raised. The saw has a rather short and thin blade, and a simple flat handle. The long stalk-bladed saw, which has been specially designed for subcutaneous osteotomy, is by no means suited for section of the lower end of the femur, or of the shaft of the tibia, in the case of a child. In the master-hand of an Ogston or a Macewen the osteotome may be safe enough, but I have heard of various grave accidents in connection with its employment by others, accidents which could hardly happen with a saw which is being worked from the front of the bone, and the movements of which even a prentice hand is able to appreciate and to guide.

Osteotomy in the tibia may be needed as well as in the femur in extreme knock-knee, especially

when there is hypertrophy below the inner tuberosity, and as the mere section of the bone may not suffice for straightening the limb, it may even be necessary to remove a wedge of bone either by saw or chisel. This necessity, however, rarely occurs, simple section sufficing. In extreme *antero-posterior curvature* of the tibia, a wedge has occasionally to be removed, but even then the section need not extend right through the bone. If this operation be done with the saw, as I prefer to do it, a semilunar flap of integument and periosteum may be turned up from antero-internal aspect of the shaft, and when the incisions in the bone have passed well back, the wedge may be broken out by strong forceps. To complete the operation the tibia may be bent or broken straight by the hands, and the tendon of Achilles divided. The leg is then dressed in sublimate wool and gypsum splints. After the tibia has been divided, the fibula can be broken through so easily with a properly directed and sudden jerk, that osteotomy of its shaft can rarely be needed. But in breaking this or any other long bone, the existence of junction-cartilages must be remembered.

Genu extorsum, out-knee, is the common form of bandy leg, the thigh bone and the leg bone being bowed outwards, so that the knees are widely separated. The condition is frequently met with in heavy, rachitic children, in whom the bones happen to be more inclined to give way than the ligaments. When the ligaments are the first to give way, genu valgum results. On account of the strong support which is afforded to the outer side of the knee by the ilio-tibial band, the external lateral ligaments are competent to resist any strain which they may be called upon to bear. In most cases of genu extorsum the outward thrust of the knee is not associated with any alteration in the shape of the femoral condyles, as is the case in genu valgum. (See *Lancet*, 1889 ; p. 173.)

Treatment.—Many of the remarks made in connection with the subject of genu valgum apply to genu extrorsum. But as the knee is displaced outwards, without being itself affected, it would be incorrect to bandage the limb to a long inside splint; for the effect of this would be to throw a useless strain upon the internal lateral ligament, which is in no way in fault. Should this be done, and the internal lateral ligament yield under the continued force, the production of genu valgum would be employed to correct the outward bowing, and the improvement obtained in the limb would be apparent, not real. In any attempt at forcible straightening of the limb, the integrity of this ligament must be respected. The gentle compression, and the employment of force, should be exerted upon the femur and upon the tibia, never at the joint. But though forcible straightening may be of value in the treatment of these limbs in early childhood, it is frequently superfluous, for with rest and supervision the young child will outgrow the deformity. The heavy mechanical supports supplied by the makers of apparatus are of little service, whilst to allow a child with soft bones to walk about in "irons" is a violation of sound principles. What is required is absolute rest. But when the bones are more solidly developed, as in approaching puberty, Macewen's operation upon the femur, with, perhaps, section of the tibia, may be demanded if the deformity be extreme.

Bow-leg is a simple curvature of the tibia and fibula; there is no bending of the femur, and the knees may be brought close together, but when bow-leg is associated with curved femur, the knees are widely separated, and the condition is called genu extrorsum. Bow-leg may often be observed before ever the child's feet have been put to the ground, in which case the curve taken is generally an exaggeration

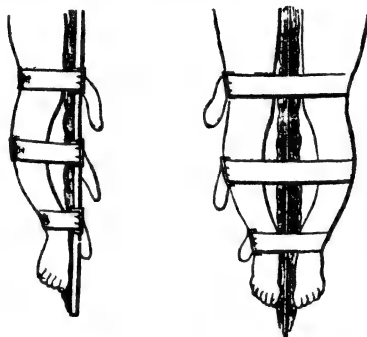
of the natural bend of the tibia. Frequently the deformity is the direct result of that peculiar habit which the rickety child possesses, of folding its legs across each other, and sitting upon them tailor-wise. Such deformity is probably, in error, ascribed to the effect of muscular contraction ; if this were the case, other long bones, such as the humerus, should be found bent. In very rickety children the humerus may be bent inwards just below the insertion of the deltoid, but this is from the soft bone yielding to the weight of the fore-arm and hand when the limb is raised.

The treatment should be begun as soon as the existence of the deformity is recognised. If the child be badly nourished, or rickety, he should be tended with special care (page 63). For the keeping up of an even circulation in the legs, warm stockings and woollen gaiters are advisable ; for if, when the child is being carried or wheeled out in the open air, the legs become chilled, the nutrition of the bones suffers. Frictions in the direction of the venous and lymphatic return should be employed morning and evening, after the warm bath ; and if the patient be flabby, weakly, or ill-nourished, not only the legs, but the entire body should be rubbed over with cod-liver or olive oil.

Bathing the legs in cold water is not advisable, except in the warmest weather, and not even then, unless the circulation be found sufficiently brisk to set the skin in a glow directly afterwards. Warm sea-water, natural or artificial, will be a most useful stimulant ; but parents must be disabused of the widespread belief that allowing the weakly child to amuse itself with naked feet on the sea-shore is necessarily conducive to improvement. Indeed, as a rule it is harmful, for it keeps the child's weight upon his limbs, and also chills them, driving the blood to the trunk, and so causing congestion of brain, lungs, or bowels.

Very many children with bent legs have been brought up on the bottle, and many of them on condensed milk or a farinaceous diet. Fresh milk, eggs, and meat will be wanted, but no tea, beer, or wine.

If the treatment thus briefly sketched out be adopted, and the child be taken entirely off his feet, a



Figs. 11 and 12.—Simple Treatment of Bow-leg.

steady improvement will set in ; but if the deformity be already considerable it will be well to adopt certain accessory measures. Thus, a light wooden splint, padded on each side, may be fixed between the limbs, and the legs bandaged to it. The splint should be long enough to reach some inches below the level of the feet, so that the child may find himself unable to stand, for it is absolutely necessary that no weight be transmitted through the leg bones (Fig. 12). To apply splints of wood or iron, and then allow the child to walk, is erroneous. Children do not fret when they are made clearly to understand that they must be kept off their feet, nor does health suffer from the enforced rest. The child should be taken out of doors as much as possible. The spinal column is probably as

weak as the leg bones, so the less he is sitting up the better. If only one leg be bowed, it should be secured to a long inside splint, so as to ensure rest (Fig. 11). An improved condition of the bones is brought about more by the rest, and the adoption of general measures, than by the mechanical effect of bandaging. The author had under treatment a little girl with marked bowing of each leg; one leg he treated by forcible straightening under chloroform; the other he left alone. The child was taken totally off her feet, and at the end of a year the bandiness had almost entirely disappeared from each leg. The rest necessarily obtained by the leg which had been forcibly straightened had brought about an equal improvement in the other. With supervision, the deformity is sure to diminish, with the growth of the child; but frequent manipulation and even forcible straightening may be found of service. When force is being employed, care must be taken to grasp the limb so that the epiphysial cartilages do not risk being detached.

In extreme cases osteotomy may be performed, somewhat after the manner described on page 97.

Weak knees.—A child, of four years, has recently been under treatment for a knee which had suddenly become valgous, after some supposed or real hurt. There was only the slightest amount of effusion in the joint, and pain was complained of only after exercise. The child was rachitic. The leg was much deflected outwards as the boy walked or stood. Most of the other joints were weak, and an abnormal amount of rocking was permitted at the other knee, even when fully extended. The limb was secured in a moulded splint, the knee being straight; instructions were given in massage, and rest was enjoined. Tonic medicines were prescribed, and with excellent result, the limb becoming straight and strong in due course.

Pigeon-breast is produced in the rickety, or

soft-boned child, by the bending inwards of the anterior extremities of the ribs. Thus the chest is compressed from side to side, whilst the antero-posterior measurement is increased (Plate II.). This is caused by the imperfect expansion of the chest during inspiration, and may be secondary to chronic enlargement of the tonsils, when those glands project sufficiently to cause dyspnœa. During the act of inspiration a partial vacuum is produced in the interior of the thorax. The atmospheric pressure upon the outside of the chest restores the balance by forcing inwards the pliant part of the thoracic wall, rather than by driving the full supply of air through the glottis. Alexander Shaw, who first suggested this theory, adduced an interesting clinical account bearing upon the subject :— A little boy suffered great difficulty in breathing, from enlarged tonsils ; he was pigeon-breasted. A sudden attack of extreme dyspnœa demanded the performance of tracheotomy ; a few days later the tonsils were amputated, the chest filled itself with air during each inspiratory act, and the costal deformity completely vanished. Laryngismus stridulus also may cause the deformity ; the spasmodic contraction of the glottis is often found in rickety children. Adenoid vegetations should also be looked for (page 210).

The general health must be improved by iron, cod-liver oil, quinine, and lime-water ; the condition of the alimentary canal must be regulated, and enlarged tonsils, or other causes of the imperfect entrance of air, must be fully attended to. No truss, or other instrumental pressure against the prominent sternum is required. Night and morning, and often in the course of the day, the hand of the nurse or mother should, by firm and gentle movements, help to correct the anterior bulging of the chest. Frequently the child should be made to take in several deep inspirations. This exercise should be performed slowly and

methodically. Exercise with light dumb-bells and "chest-expanders" is desirable, as are also gymnastics generally, provided always that the strength and capabilities of the feeble child be not over-taxed thereby.

Bowing of the sternum may occur when air is greatly hindered in entering a soft-walled thorax. It is caused by a pulling backwards of the xiphoid end of the bone by the energetic but vain contractions of the diaphragm. No treatment which does not secure a freer entrance of air can avail.

CHAPTER VII.

ENLARGEMENT OF LYMPHATIC GLANDS.

ENLARGEMENT of lymphatic glands may be the result of local or constitutional causes. Usually it is determined by local irritation; and, in the case of a weakly or unhealthy child (strumous, let us say), a trifling irritation of the peripheral lymphatics may give rise to a disturbance in the gland associated with it, serious out of all proportion to the local lesion.

Cervical glands.—A chain of glands (glandulæ concatenatæ) extends along the entire length of the deep surface of the sterno-mastoid. Should one gland be enlarged from irritation, others may in time become involved, even though the primary source of irritation may long since have healed. Thus, it may be impossible to determine the exact cause of the enlargement, so that we are apt to suggest that in certain cases of struma the glandular enlargement is a primary affection. It is more likely that, the child being strumous, a slight lymphatic lesion commenced the disease. A common cause of enlargement is irritation of the pharyngeal mucous membrane by **sewer gas**.

Though a healthy child may be the subject of enlarged glands from this cause, a strumous one is much more likely to suffer. In such circumstances the fauces might possibly be found congested or inflamed; but all trace of irritation may have passed away before advice is sought for the "lumps." In every case the throat should be inspected.

On one occasion,* children from three different families, resident in a district where a sewer had been for some while emitting volumes of foul air, were under treatment for cervical abscess. In one of these families the children were markedly strumous, and had not the existence of the neighbouring sewer ventilation been known, we might have been inclined to regard the chronic glandular enlargement as an independent manifestation of struma, no definite lesion about the pharynx or elsewhere being, perchance, discoverable. But the use of the word "struma" must not be made a scape-goat in an endeavour to explain the occurrence of glandular enlargements when no other source of irritation happens to be discoverable. A follicular abscess, which has long since healed, may have set up glandular enlargement throughout the whole neck of that child, whose lymphatic tissues have been already prepared for destructive disease by an inherited taint of struma, or by the effects of a prejudicial environment. One gland after another, along the chain, may be invaded by inflammation, and ultimately destroyed by suppuration, there being no room for doubt but that some morbid material had passed from one to another by a kind of filtration. In the case of strumous inflammation of the lymphatic glands, the whole course of the disease, from hyperæmia to abscess, may be run with little or no pain.

The cervical glands are much exposed, and are

* *Lancet*, Aug. 3, 1878.

connected with surfaces of skin and mucous membrane which are very prone to inflammation and ulceration. Particularly is this the case with glands in association with the nares, mouth, pharynx and tonsil; when one of these areas is attacked the glands are quickly enlarged. Amongst the most common of the local causes of enlargement are irritation due to the presence of pediculi, scalp wounds, eczema, and impetigo, otorrhœa, carious teeth, sore throat, and hypertrophied, inflamed, or ulcerated tonsils. The absorption by the bucco-pharyngeal lining of the poisonous exhalations from closets, drains, or dust-bins may cause the enlargement. And this cause is often overlooked.

The chief constitutional causes are struma, and the weakness left after measles or scarlet fever; but in the latter case the enlargement may have been determined by the ulceration of the throat and tonsils; in the case of diphtheria, also, the swelling may be considered as of local rather than of constitutional origin.

Decayed teeth should be looked for, and the importance of such examination can hardly be overestimated. Children may have such a dread of being submitted to the dental surgeon, as to deny that a tooth has ever ached, lest the admission of the fact should entail extraction. A carious spot in a tooth of the first set, if the glands of the neck of that side be enlarged, demands immediate extraction of the tooth, even though it have never ached; for irritation may be set up in the alveolar lymphatics sufficient to cause glandular enlargement and even abscess, although there may have been no pain or discomfort associated with the tooth. A child prone to glandular enlargement should not be allowed to run the risk of a lymphatic irritation, which may at any time be started by the presence of a tooth of questionable integrity. A tooth of the permanent set which may be irritating

the peripheral lymphatics must be dealt with according to circumstances. It may be extremely inexpedient to temporise with a serious offender. If enlargement be due to the improper eruption of a tooth, the gum lancet may end the complication. In connection with these remarks, I would urge the importance of all children being examined by the dental surgeon at regular intervals, say of six months, in order that anatomical and pathological irregularities of the teeth and mouth may be prevented or arrested.

The irritation caused by the presence of **pediculi capitis** is a common cause of enlargement, and even of suppuration of cervical glands. If the child be of an unhealthy nature, the suppuration may be extensive. One can often tell at a glance if the cervical adenopathy be caused by the irritation of pediculi. The child is generally pale and miserable, and has a peculiar dry look about the hair. Very often this dry hair has been carefully plastered down by the mother before the child is brought for advice, lest the surgeon should discover a "dirtiness" of the scalp. It is advisable in every case of enlarged cervical glands to inspect the scalp; it were an insult to ask a mother if the head is "clean." The surgeon should exercise judicious tact in examining it, and it had better not transpire why he makes the inspection, lest offence be taken. My own method of proceeding is to take off attention by asking if there has ever been a sore place on the head, and then, without heeding the answer, to make a thorough examination of the scalp. If pediculi be there, they will most likely be found on carefully raising the lank hair behind the ear. On quietly showing a pediculus (but hardly else, for the ova attached to the hair do not always carry conviction), the mother generally feigns surprise, and willingly engages to carry out all instructions.

Treatment.—The hair must be cut quite short,

or, better still, the head may be shaved, for if short hair be left, adhering ova may cause further trouble. (The hair should be burnt.) The head should then be washed with soap and water, sore places covered with simple ointment, and a skull cap tied on by strings beneath the chin. At once the glandular enlargement begins to subside, but oil and iron may be required.

The lymphatics of the elbow and arm-pit.—There is one gland at the elbow, just in front of the internal intermuscular septum, which is often inflamed from injury or disease of the hand or forearm. A cluster of the axillary glands may be enlarged in lymphadenoma. Whenever one suspects serious disease of the lymphatics (page 118) the arm-pits should be explored. The best way to find enlargement is to pass the tips of the fingers to the very apex of the space, the arm being kept loosely to the side, and then, by slowly dragging the fingers down the side of the chest, to allow the glands gradually to slip up again between the fingers and the ribs. These glands are often implicated after vaccination, and especially, if the child were unhealthy at the time of the operation.

The groin lymphatics.—If the enlargement be in the neighbourhood of the saphenous opening, the child's trousers and sock should be taken off, and search made for sores about the toes, foot, leg, and thigh. Common causes of glandular disease are chilblains, ingrowing toe-nail, the chafing of the heel by a badly-fitting boot, a scratch, a bruise on the knee, and the irritation of scabies. The more unhealthy the child the greater the risk of the secondary trouble being severe. Possibly the bruise or abrasion which started the enlargement may have healed some time since, the mother never having noticed it. With the on-coming of the fresh trouble in the groin, the initial

lesion is very apt to be forgotten. A careful search may sometimes discover the pink scar of a sore which has recently healed. The child's word should not be taken as evidence of there having been no "sore place" upon the leg or foot previous to the occurrence of bubo. If the enlargement be along the line of Poupart's ligament, careful inspection must be made of the buttock, perinæum, scrotum, and penis, the prepuce being thoroughly retracted, and the membrane beneath it examined. A healthy boy has lately been under treatment for buboes which were caused by a tight prepuce.

A **popliteal** gland may be the seat of enlargement, and of abscess, either on account or independently of a sore upon the outer side of the foot, the heel, or the calf. The abscess should be opened, as a rule, through the interval between the ilio-tibial band and the tendon of the biceps; the limb should be fixed by a splint. The evacuation of the abscess is often followed by an intractable sinus, which may require to be carefully laid open and scraped out before its obliteration can be obtained. The knee must be kept straight, and in perfect rest.

In certain cases of strumous enlargement of the glands, when general measures have been submitted to a prolonged and unsuccessful trial, the surgeon may advise the adoption of more active measures. An operation for the removal of the glands may be not only justifiable, but expedient; but the risks from shock, hæmorrhage, septicæmia, and exhaustion must be duly considered. The glandular tumours may be but a local evidence of serious constitutional weakness, so there need be no hurry about the decision; and before operating, the carious teeth, which might be a source of present or subsequent irritation, should be extracted. With judicious treatment, and especially under the influence of sea breezes, enlargements

may disappear, and old-standing sinuses cease to discharge.

Leeches, lotions, and counter-irritants to the skin over the gland are of little use in promoting absorption. In certain cases they may do harm by exciting the circulation, and determining the wreckage of a mass in which, but for this meddling, such disaster might not have supervened. Tincture of iodine, which is often painted over the skin, is occasionally applied more for the sake of "doing something" than for any real belief in the therapeutic efficacy of the measure; but iodine administered internally may be useful. Probably it is partly through the influence of the iodine in the air that a stay at certain sea-side places effects so much. Bryant iodises the air of the sitting and bedroom of the patient by putting some solid iodine in a perforated box, and placing it on a shelf. The treatment by injection of acetic acid into the glands is not to be recommended.

Iodide of lead ointment may with advantage be rubbed over painless glands which have not melted in suppuration; it should be applied night and morning. Our forefathers held the compounds of lead in high esteem as "discutients."

We should not invariably recommend **excision of indolent enlargements**, because, as puberty approaches, there is a great probability of their quiet subsidence. But if the child's health be poor, and no improvement be effected; if the masses be large, and few in number; if they be numerous and increasing rather than diminishing, and apparently disturbing the well-being of the patient; or if they threaten suppuration, they may be shelled out. Such a network of scar tissue as one occasionally sees after the spontaneous evacuation of glandular abscesses could not have occurred had operative measures been adopted.

Mr. W. K. Treves writes:—"It is time that the rank absurdity of treating scrofulous gland swellings with drugs to promote absorption should be exploded. Of course I am not referring to recent gland swellings, which may not contain scrofulous deposit, and which may be resolved.

"These deep glands seldom approach the surface by suppuration. The best that can be hoped for, if they are left alone, is that their contents may undergo calcareous degeneration; meantime they keep the patient in bad health, and may extend and cause other and more serious complications. I think all diseased glands should be got rid of either by scooping or the knife, and that the latter has been too much neglected. I have excised glandular swellings for many years in the Margate Infirmary without in any instance meeting with a fatal result."

This method of treating scrofulous glands has passed safely through its period of probation, and is now a recognised measure. It is unfortunate, however, that its great value is often overlooked, or ignored, by the family medical attendant who generally takes charge of the patients in the earlier stages of the disease, the operating surgeon seeing them only when suppuration has far advanced, the skin being undermined, and a considerable series of glands being matted together, or on the point of forming a diffuse abscess. Provided only that treatment be not too long delayed, the cases are very manageable; and, instead of the child's neck being permanently marked with irregular and hideous scars, a thin white line is all that ultimately remains as evidence of disease and treatment. If it be a fact that a caseous lymphatic gland may be a centre from which infecting material may be conveyed to, and start inflammatory changes in, other glands in anatomical association, it is manifest that it should be removed forthwith.

Fowler, of Brooklyn, says that what may appear, and, in the opinion of the old teachers, was, an innocent cheesy gland, contains a material which may rapidly propagate caseous lymphadenitis; that this caseous infiltration, in all probability, is either the bearer of, or the proper soil for, the germs of tubercle; that during a period of quiescence the patient is threatened with an outbreak of general tuberculosis. This may be but a speculation; but practice based upon it seems to lend it strong support. Ziegler speaks with much confidence of the dependency of tuberculous lymphadenitis on the presence of bacilli. "The tuberculous bacillus usually reaches the glands by way of the lymphatics; and as it sets up tuberculous disease at its point of entrance into the body, the affection of the glands is secondary." He remarks on the difficulty, which frequently arises, of deciding whether a gland is tuberculous or not, and suggests that some of the so-called scrofulous inflammations of the glands, in which no typical tubercles can be found, are really dependent on the invasion of tuberculous virus.

Mr. Teale* teaches that "such degenerate structures, even when not suppurating, are centres from which health-damaging and death-dealing material may be diffused throughout the human frame." He also directs attention to the fact that the visible surface abscess, which would often be called a strumous suppurating gland, is merely a subcutaneous storage-reservoir of pus, and that its source, a degenerate gland, is not subcutaneous, but is situated beneath deep fascia, or even muscle. In these circumstances, the communication between the two places may be but a narrow opening, large enough to admit a probe only, and a close search may be needed for its discovery. Thus are to be explained many chronic sinuses and weeping sores, the unhealthy burrowings, and the open,

* "Clinical Lecture," *Medical Times*, 10 Jan., 1885.

indolent ulceration associated with strumous glands. A scraping operation may promote the rapid healing of such sores, and the mark left by prompt surgical interference in such a case is insignificant, compared with the scar which results when a sinus has been allowed to heal at its own slow leisure.

It is surely advantageous to convert an undermining and unhealthy sore, and a possible source of septic infection, into an open, clean, and granulating ulcer. If it be right to remove one degenerating gland, it must be right to remove every compromised gland, as sooner or later they are likely to be the seat of abscess. Every enlarged gland, therefore, should be weeded out; and through a single incision glands which lie at a considerable distance may usually be reached. Thus the finger and forceps may work beneath the sterno-mastoid from the base of the skull to the submaxillary, to the thyroid, and even to the clavicular regions. After the skin-wound has been made the scalpel should be laid aside; the glands must be torn out, not dissected, or serious damage might be done and troublesome hæmorrhage started. If the capsule of a suppurating gland cannot be enucleated it must be thoroughly scraped out, and the track which leads to a deeply-placed abscess may be dilated by dressing forceps. It is well that the parents understand that the one operation, however thorough it may be, may have to be followed by other operations at varying intervals of time. It is well not to keep the incisions too small; the operator should be able to see what he is doing.

A thin piece of drainage tube may be introduced into the deepest part of the wound, and kept in position for about a week. A mild lotion of carbolic acid may be used for the washings; the dressings will be of whatever antiseptic material the surgeon may prefer. When the drainage tube has done its work, it may be replaced

by a slender ribbon of indiarubber tissue, so that the external wound may not heal before the deeper parts of the track have become obliterated.

The sutures are best made of horse-hair which has been soaked in a warm antiseptic solution. They should be removed on the second day, lest their situation be permanently marked, and the wound may be kept from tension by the careful adjustment of strips of adhesive rubber strapping.

Usually no constitutional disturbance, nor suppuration, follows the removal of the diseased glands, and the wound heals by first intention except where the slender drainage was arranged. Poultices and wet applications should be avoided. I generally dress the wounds with a thick fold of sublimate wool, and then fix the head and neck securely between two large sand pillows, allowing the child to rest the head on a thin cushion. For some days after the operation the child should not be allowed to sit up, for movement is prejudicial to healing. When the child is permitted to get up, the neck should be kept stiff and at rest by a deep collar, or a stock of buckram. But if it be probable that the case will run a prolonged course it is better, before operating, to prepare a collar on the principle of that advised in the treatment of cervical caries (page 262), which must be worn whilst the child is up and about, and even for some weeks after the wounds are soundly healed, the sand pillows being still employed at night.

Appreciation of operative measures.—If, in spite of the zealous adoption of approved general measures, the lymphatic glands continue to grow, or begin to soften, they should be enucleated. If they be allowed to soften, abscess is certain to follow, and continued suppuration will be followed by permanent disfigurement. Possibly the softening gland may be a centre from which infective material (tubercular)

may be carried throughout the system (page 62). The scar left after enucleation (or scraping, in the case of abscess) will almost certainly be less conspicuous than that which would result if the abscess were allowed to run a natural course.

Thermo-puncture is a method of dealing with scrofulous glands which was introduced by Treves. A small needle, of Paquelin's apparatus, is heated to a bright heat, thrust through the skin into the gland substance, and made to penetrate that tissue in three or four directions, just as in treating subcutaneous nævus. If movable, the gland must be steadied by the finger and thumb. If pus or cheesy matter escape, a poultice should be applied; but if not, the scar may be dressed with vaseline and eucalyptus.

Electrolysis.—The treatment of scrofulous glands by the electrolytic caustic, as described by Golding-Bird, is not, I think, very practical.

Lymphatic suppuration.—Glandular abscesses should not be allowed to run their own tedious course, even though their gradual increase in size be not accompanied by pain or discomfort. Sometimes, when left to nature, the scar of the opening is found eventually small and insignificant, but more often the spontaneous evacuation is associated with prejudicial undermining, thinning of the integument, and extensive sloughing and ulceration. When pus has been definitely made out, it is useless to hope that it will be absorbed. The expectant policy is certain to be followed by disappointment. The pus should be let out in one of the ways hereafter to be suggested. Only in rare instances are the fluid contents of the abscess absorbed, whilst the solid parts become converted into a cretaceous mass. It is inexpedient to leave collections of matter in the cervical tissues; it is impossible to say where they may eventually find exit. The presence of the matter

may excite irritation, and cause the formation of adhesions outside the abscess wall. These adhesions may melt away before the advancing pus, and discharge may at last take place into the posterior mediastinum, œsophagus, or even into one of the large veins of the neck. The differentiation of spinal abscess in the neck from that of chronic gland disease is found on page 252.

If an inflamed gland be rapidly increasing, so as to cause tension of sensory nerve filaments, pain is great and relief is demanded. It is advisable, also, to relieve the tension of the enlarged and acutely inflamed gland, even though no fluctuation can be discovered. In acutely inflamed tissues, where sensory filaments are in distress, puncture or incision will often be the means of affording escape for small quantities of thick pus where no actual suppuration had been discoverable. Though a child with acute abscess in the mastoid gland may be deprived by pain of sleep and appetite, he will become happy and quiet as soon as the tension is released.

To open a glandular abscess, chloroform should be administered. Thus distress and apprehension are saved, and the surgeon can proceed more at his leisure, and effect the evacuation with greater thoroughness. The surface of the neck having been washed, a slender blade is thrust through the skin, and the interior of the mass reached by a director, and ring dressing forceps. The opening is made in what will be, when the abscess has been evacuated, the lowest part. (The aspirator is never suited for the evacuation of gland abscess.) The cavity may then be scraped, and washed out with warm boracic acid solution, and a slip of guttapercha tissue laid through the wound to prevent premature closure. The wound may be dressed with a fold of lint, wetted in boracic lotion, and covered with indiarubber tissue. Poultices

would irritate the skin around the opening, and cause the appearance of vesicles or pustules. If a poultice be applied it should be small, and the adjacent skin should be kept thoroughly protected with a coating of vaseline. Simple incision of these abscesses must give way to the more successful plan of scraping, washing, and drainage; the mere puncture of a gland abscess is not advisable; the wound heals, and has to be reopened; the skin becomes undermined and ulcerated; the sore keeps on discharging for a long while, and an unsightly scar results.

Scraping out the gland capsule is of value where a chronic sinus refuses to heal, and health suffers from the discharge, or where strumous glands form an unyielding mass in neck, axilla, or groin. When a mass of gland, large or small, has been isolated by suppuration around it, it must be thoroughly scraped away before a healthy condition can be established.

The operation will be a prolonged one if the disease be at a considerable depth below the deep fascia. Chloroform having been administered, and the surface of the neck washed with an antiseptic lotion, a free incision is made down to the gland, or access obtained by a combination of dilatation and incision; or the capsule may be opened by the thermo-cautery. With Volkmann's spoon, the whole of the mass is thoroughly scraped out, and the cavity treated with iodoform or with carbolic lotion; a small drainage tube is passed into the depths of the cavity, and, if advisable, a fine suture or two are inserted in the wound.

The fact of a child suffering from threatening phthisis need be no bar to the expediency of operation. Indeed, when the abscess cavity has become obliterated by healthy granulation, the child may the better be enabled to struggle against the pulmonary trouble.

Prognosis.—Care having been taken as regards the diet and the surroundings of the subject of

strumous glands, and cod-liver oil and iron being administered, there is every prospect of steady recovery, provided the affection be not excessive as regards the size of the tumours and the area of distribution. If any joint be affected, or if strumous ulceration exist on various parts of the body, the outlook is necessarily darker, as it is evident that the constitution is deeply implicated, and, by way of expediency, it may be advisable to amputate the diseased limb.

That perfect recovery is not rare, even after extensive implication of the glands, is evinced by the white or coloured network of unsightly scars which cannot be hidden on the necks of many a grown person. The scar does not necessarily become less conspicuous with the growth of the child ; it may even increase commensurably with other tissues.

Simple lymphomata are tumours resulting from overgrowth of lymphatic glands, independently of local irritation and inflammation. The process is a slow one ; the glands cluster, and sometimes fuse together ; at first they are not adherent to neighbouring structures. They are most often seen in the neck, where they may form enormous, lobulated masses, along the whole length of the sterno-mastoid. Lying beneath that muscle, they cause it to be pushed aside, flattened, and thinned. They may be handled without pain ensuing, and they will be found so freely movable that, but for their number, they seem almost to invite the surgeon to shell them out. Fortunately, these lymphomatous tumours generally have a capsule from which they may be dislodged.

Operation.—There should be plenty of time and light at the disposal of the surgeon, for the operation is certain to be long and tedious. One of the chief points to be attended to is the prevention of hæmorrhage. The neck should be cleansed, and an incision is

made through the integuments. Every bleeding point should be secured, either by pressure forceps, or by a fine cat-gut ligature. There should be a plentiful supply of these ligatures close at hand, and after a gland has been partially enucleated by the fingers, the vessels entering it should be ligatured before the knife completes the removal. If several glands be fused together, each slender pedicle should be tied in two places before the section is made between the ligatures, otherwise there may be needless loss of blood through collateral routes. But if the surgeon enucleate the glands by using fingers and forceps, rather than scalpel and scissors, he will have little to fear from bleeding. The after-treatment will be just that which has been described in connection with the removal of scrofulous glands (page 113), and, as in that case, the surgeon must be prepared to find a second or a third operation needed, even though he may have removed, so far as he could tell, every enlarged gland at the first attack.

The constitutional treatment will demand fresh air ; a liberal diet ; and cod-liver oil and iodide of iron. The drug is not yet discovered which can prevent the recurrence of the glandular enlargement or determine its subsidence. Arsenic may prove helpful.

In **Hodgkin's disease** (soft lymphadenoma, lympho-sarcoma) the glands are enlarged in various parts of the body ; they are smooth and movable, and vary in size from a pea to a hen's egg. Compared with lymphoma, it is a rare disease. At the onset, only one group may be affected ; as, for instance, the glands of the neck. In due course those of the corresponding axilla, the groin, or the mesentery, are implicated. The kernels increase rapidly in size, so as to form large tumours, which are of a soft and brain-like consistence. The lymphatic elements of the liver, spleen, and kidney are affected with a

similar hyperplasia. The spleen may be enlarged to ten or twenty times its usual size. "In all important respects this disease resembles leucocythæmia, with the exception that the multiplication of white corpuscles is wanting."* It is not associated with tubercle. The child grows weaker, and eventually dies exhausted. The course of the disease is apparently uninfluenced by constitutional remedies, and the enlargement of the glands being but a local expression of a general dyscrasia, surgery can give but slight help. To recognise the existence of such a disease as leucocythæmia is to admit the advisability of avoiding active surgical interference in the early months of glandular enlargements generally. It would be a misfortune to attack the glandulæ concatenatæ by operation, and then to find that the cervical enlargements were but the foreshadowing of serious constitutional malady. Exact differential diagnosis of simple from malignant lymphoma is, in the early stage of the disease, impracticable.

For the **general treatment** of what may well be called malignant disease of the lymphatic system, there is little to add to the remarks already made (page 108). *Liquor arsenicalis* in small doses (but increasing), repeated at short intervals, may have a prolonged trial.

Operation in malignant lymphoma may be required if the growth of the gland-masses cause dyspnoea, either from pressure against the side of larynx or trachæa, or from pressure directly upon the front of it. The child will be liable to sudden and aggravated attacks of spasm, one of which may prove fatal. In such a case, tracheotomy is demanded. The operation may be long and difficult; it should be performed cautiously, and if it be found necessary to cut through a gland-mass (supposing that it cannot be

* Wagner's "Manual of General Pathology."

enucleated), it may be well to use the thermo-cautery for the purpose. An unusually long tracheotomy tube may be needed. If it be thought inexpedient to undertake a tracheotomy for the dyspnœa, some temporary relief to pressure may be afforded by division of the deep cervical fascia.

The obliteration of depressed cicatrices is the subject of an original essay by Wm. Adams, in which he recommends the subcutaneous division of deep adhesions of the cicatrix by a fine tenotomy knife, or an ophthalmic blade, which is introduced a little beyond the margin of the cicatrix and carried down to its base. The cicatrix is then carefully elevated, and kept in that position by passing a couple of fine hare-lip pins beneath it at right angles to each other. On the third day, when the pins are removed, the scar tissue, which is now infiltrated and swollen, may be allowed to find its level. It will probably remain for a while somewhat raised above the surrounding skin. If several punctures be required for the complete division of the adhesions, the tiny wounds may be used for the passage of the pins. If suppuration follow the operation, the wound may be treated with water dressing and oil-silk. But a child with an extensive or depressed scar is likely to be of a weakly nature, and little suited to undergo operative interference of any sort. It may be well to let such patients attain to puberty before advising operation, so that constitutional vigour may be assured. There must be always a certain amount of risk attending the ultimate improvement of appearance, and of this the parents should be made thoroughly cognisant. Nevertheless, the operation is generally followed by considerable improvement.

CHAPTER VIII.

TUMOURS.

THE tumours in childhood differ from those seen in later years. As might have been anticipated, growths upon the type of embryonic connective tissue (sarcoma) are common. Congenital sacral tumours (page 125), hygroma, nævus, meningocele, and sebaceous cysts of the scalp need special descriptions.

For clinical purposes, it is necessary to arrange the tumours into two groups, *innocent* and *malignant*; the latter comprises the sarcomas, their features are these: They grow rapidly, and often invade the neighbouring tissues; so they become fixed to adjacent parts, and implicate the skin. They are often associated with ulceration, sloughing, and hæmorrhage; they cause deposits in the lymphatic glands associated with them, or, being circulated in the blood stream, their elements form secondary deposits in distant organs. Sarcomata are, unfortunately, of frequent occurrence in childhood; tumours on the epithelial type (carcinomata) being very rarely met with.

Sarcomata, like the embryonic tissues upon the type of which they are founded, are met with in several varieties. The round-celled sarcoma is the representative of the lowest form of development, but of the highest malignancy. The giant-celled or myeloid sarcoma is the representative of the medulla of embryonic bone; it is the least malignant form of sarcoma. Sarcomata differ from the tissues on the type of which they are formed, in that they show no desire for the higher development. Were it otherwise, they might grow into fibrous tissue or muscle, and so become harmless elements in the parts which they infest. The cells lie in immediate contact with the

thin-walled vessels of the tumour, and, readily entering the blood stream, they become quickly disseminated. They have a much less direct association with the lymphatic vessels. Sarcomata are painless, though if they be growing quickly, there may be discomfort from tension of sensory nerves. Sometimes the growths are hard, sometimes soft, but they are generally smooth and rounded; they are apt to grow after injury to a bone, and then they closely simulate periostitis, or osteitis with a central necrosis, and errors in diagnosis in connection with them are of common occurrence.

Case.—A girl of seven years was admitted to the Children's Hospital in September, 1888, for a painful and "throbbing" enlargement in the head of the tibia; in the previous February she had fallen and had cut her stocking in the fall, in the exact place of the tibial enlargement. The skin was warm over the tumour, and there was a feeling of boggiess in the parts beneath. As all her trouble dated from the fall, it was more than probable that the swelling was inflammatory, but the diagnosis was withheld until an incision was made into it, when the bone tissue was found to be replaced by a soft, succulent growth. Amputation was performed in the lower third of the thigh, so as to be well above the popliteal glands, which might possibly have been infected from the sarcoma. She made a rapid recovery.

The **myeloid sarcoma** springs from osseous tissue and periosteum, especially that of the jaws, and from the articular ends of the long bones. It grows slowly, and on account of the great size of its elements (giant cells) it is less disseminated by the blood stream; when once a growth of this sort has been completely removed, recurrence is unlikely. The commonest form is **epulis** (*ἐπί*, upon; *οὖλον*, gum). Sometimes it is necessary to extract one or more of the teeth before a growth which is associated with the periosteal tissue

MYELOID SARCOMA.



Fig 1.



Fig 2.

MOLLUSCUM CONTAGIOSUM

can be entirely removed. The epulis is apt to be, especially in its deeper parts, osteo-sarcoma. In a child recently under treatment (Plate IV. Fig. 1), the epulis had grown quickly and extensively; for its complete removal it was necessary to take away the inferior maxilla, from the front of the masseter to considerably beyond the symphysis. (*See also page 190.*)

On making an exploratory puncture, the bleeding had been so furious that nothing short of section of the maxilla was deemed expedient. When a myeloid sarcoma springs from the medulla, or cancellated tissue of a long bone, a strange expansion of the osseous tissue may take place, pulsation and "egg-shell crackling" being distinguishable (page 393).

The only **treatment** available is that by operation, and operative procedure must be both prompt and thorough. The removal should be effected through healthy tissue, and at a considerable distance from the limit of the disease. That effort of the surgeon which may be commendable for its conservatism in operations for injury or for innocent growths, must be condemned when the interference is for malignant disease.

The more rapid the growth of a tumour the greater the desirability for its removal; early infancy does not preclude operation.

In case of doubt, glandular enlargement should not be waited for; exploratory incision should be made. No time should be lost; high amputation may offer the only chance of success.

Amputation at the hip for malignant disease of the femur in childhood is not desperate, if done early. It should be performed after the manner of Furneaux Jordan (page 457).

Prognosis.—If surgical interference have long been delayed, the child may sooner fall a victim to deposits in lung, liver, or other viscera; and this is

particularly the case with disease affecting the testis. In other children, death may be caused by the exhaustion attendant on ulceration, suppuration, or hæmorrhage.

CONGENITAL TUMOURS.

Congenital tumours may depend on developmental errors in normal tissues. Several varieties are described in a lecture by J. Hardie: (1) Included foetation; (2) disassociated blastoderm; (3) tissue hypertrophy (*Lancet*, 1885).

1. **Included foetation; attached foetus** is the result of a fusion of two embryonic areas which have been accidentally formed in the blastodermic vesicle. The fusion, or attachment, may be so slight that the surgeon might be tempted to sever the connecting band, and so set two individuals free. Or the coalescence may be so complete that one of the germs may be surrounded by the advancing development of the other, and its growth compromised. A portion only of the parasitic foetus may attain full development, and monstrosities of various kinds may thus be produced. Projection of one or more limbs of the parasite from the body of the host is an ordinary example of such a monstrosity. The inclusion might be complete at the time of birth, the parasitic members sprouting later. The growing portion of the included parasite is particularly apt to be associated with the sacrum, ovary, or testis; and the cystic formation may contain bone, hair, tooth, or other histological tissues which, but for the situation, may be of more or less normal growth. The cause of the less complete development of the included foetal remains is most probably due to the imperfect blood supply. Certain of these growths "may have been produced by some dislocation of the blastoderm of the subject, and not by foetal inclusion"

(Ziegler). According to Mr. Lowne, these cases of heterologous union are the result of a second embryo becoming wedged in between the visceral arches or laminae of another before they unite, the development of the second being arrested. Abnormalities of the viscera of the autosite adjacent to the attachment of the parasite are frequent; thus the liver may bear an unusually large number of lobes, or there may be two gall-bladders.

Congenital hypertrophy, or atrophy, may affect an entire limb or part of a limb, or any individual organ or part of it. The error of development must be ascribed to some obscure disturbance of nutrition.

Congenital sacral and coccygeal tumours; false spina bifida.—Tumours about the sacral or coccygeal region may be connected with the interior of the spinal canal, or even with one of the pelvic viscera. They must be examined with care; digital exploration through the rectum may afford evidence of their complicated attachments. It is probable that these tumours often originate as abnormal dilatations of the post-anal gut, a part of the alimentary canal which, for a certain period of embryonic life, exists posterior to the anus. The minute structure of this variety of teratomata agrees, in every particular, with the histological details of the section of the gut. (Sutton. See also page 247.)

Of a tumour in the middle line one must be particularly suspicious. Though it may be capable of some movement over the subjacent bone, it is almost certain to be rooted in the spinal canal. If we learn that it is associated with "weakness" of the bowel or bladder, there can be little doubt as to the importance of its connections. Though such a tumour may look like a fibro-fatty growth, it is likely to be the remains of spina bifida which has happily undergone

spontaneous or artificial cure. Its base may be associated with some part of the cauda equina. Appended is a sketch of a case in which, previous to our seeing the child, an unsuccessful attempt had been made to remove the growth (Fig. 13), which looked like a simple lipoma. These tumours are apt, however, to be of the nature of cystic adenoma or sarcoma.

Treatment.—If operation be determined upon, a careful dissection should be made down to the base of the tumour, with all needful precautions against



Fig. 13.—Congenital Sacral Tumour.

sepsis. If it be found unconnected with the spinal canal, it should be removed by the knife. If connected by a slender pedicle, it might be ligatured and the tumour then be amputated; but if the communication with the interior of the canal were considerable, the wound should be closed and the tumour

eventually dealt with as in spina bifida. If a sacral tumour do not increase, it may be left alone. Most of these tumours shrivel up with advancing age, but some are of such enormous size as apparently to be incompatible with life; they may be sarcomatous in their nature, and some may possibly spring from Luschka's gland. The skin over the tumour may undergo ulceration, and fatal exhaustion supervene. If a coccygeal tumour be found deeply connected with the interior of the pelvis, it had better be left uninterfered with. The shock caused by removal, or attempted removal, would be serious, while the extent of the wound would entail a long-continued and exhausting drain.

Other varieties of tumour in the neighbourhood of the sacrum and coccyx are the **dermoid cysts**, which may contain hair, sebaceous matter, or rudimentary teeth. Also tumours consisting of foetal remains of bone or cartilage, or even of the vestiges of limbs.

2. **Dissociated blastoderm ; dermoid cysts.**—In the process of evolution of the blastoderm of a single foetus, there may be an inclusion and separation from its proper connections of some portion of one or other of the three layers, causing a congenital tumour. Some of these tumours are probably due to aberrant germinal cutaneous cells from the epiblast, which have wandered to an abnormal site, and there have, at a later stage, developed after their kind. Their contents belong to the skin and its appurtenances, and are well named dermoid cysts. They are most often found in the testis, ovary, orbit, neck, and on the head. Hardie describes such a tumour on the forehead ; at birth it was as large as a marble, and seemed to have been taken for an encephalocele ; the cyst was eventually found to contain sebaceous matter and fine hairs.

Dermoid cysts of the ovary are of congenital origin, but at any time after puberty they may begin to grow. Sometimes their development may take place earlier. Thus, Dr. Roemer successfully removed a dermoid ovarian cyst, of the size of a child's head, from an infant of twenty months. This appears to be the earliest age at which ovariectomy has been performed, though in several instances dermoid cysts have been removed from children two or three years old. For further information on this subject reference may be made to Alban Doran's *Tumours of the Ovary*.

Cysts in the orbit may be recognised by their

character of fluctuation or doughiness ; a grooved needle establishes the diagnosis and effects a cure.

3. Tissue hypertrophy.—Congenital tumours of this nature may be fibrous, cystic, or fatty, or of any combination of these varieties ; they may be pendulous or sessile. The most important of them are next described.

Congenital cystic hygroma is common ; it sometimes grows with alarming rapidity, and in this respect simulates malignant disease. It may cause death by exhaustion, or by pressure on important structures. In one child, a hygroma at the root of the neck pushed aside all the movable structures ; deglutition and respiration were thus impeded, and so great was the compression upon the large veins, that the eye-lids, hands, and arms, became œdematous. Death was eventually caused by obstruction of the trachea.

The **favourite seats** of hygroma are the sublingual region (where it may be taken for ranula), the neck, and the axilla. The starting point is the fibrous tissue ; and when the growth is just beneath, or even slightly implicating skin or mucous membrane, it may be taken for nævus. Probably it sometimes begins in the deep fascia, for it is associated with the skin above, and the muscles beneath it ; an innocent tumour situated upon the surface of or beneath the fascia would be unlikely to pass through it. Hygroma of the neck may extend around the carotid sheath, and even reach into the mouth and implicate the tonsil. Rarely is it found upon the lower part of the trunk or upon an extremity. I have, however, seen a large hygroma upon the arm, and others upon the side, and upon the back. The first of these closely resembled a lipoma, but it was too firmly incorporated with the skin to be of that nature. The one upon the side was dissected out with some trouble ; that upon

the back underwent spontaneous obliteration. I have also removed one from the pinna of the ear; it implicated both skin and cartilage. Sutton compares the cervical hygromata with the large subfascial air-sacs of the chimpanzee.

Pathology.—The growth is composed of a series of cysts, which are closely or irregularly spread through a diffuse bed of fibrous tissue. The cysts are, in all probability, lymphatic spaces. Silcock and others, in silver-stained preparations, have demonstrated an endothelial lining continuous with, or exactly resembling, that of the lymphatic vessels. The spaces vary in size, and when distended they are spheroid. Some of them may be as large as an orange, or even larger, whilst others in the same growth may be of the size of a marble or pea, or just visible to the naked eye. Several of the cysts may be in communication with each other. The periphery of the growth fades away into normal connective tissue. In removal by dissection, the cysts collapse; and when separated, the growth is seen as a ragged and insignificant mass of fibrous tissue, something like a piece of torn sponge, but with vacuolations less definite. The larger and more solitary growths, when in the neck, may be described as a hydrocele. Some of them are of enormous size, and on their contents being drawn off, the cyst wall and the integument shrivel up into a pendulous and unsightly mass, which diminishes to insignificance as the child grows. When large and pendulous, the cyst may appear bluish through the thin and translucent integument.

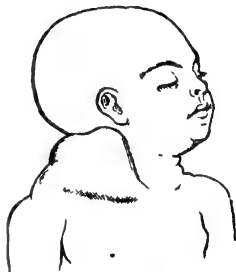


Fig 14. —Congenital Cystic Hygroma.

The adjoining woodcut (Fig. 14) is taken from an infant with an hygroma of the right subclavian region; when she came under treatment the mass was growing rapidly. It seemed to be composed of six or eight large cysts. The tapping of one cyst did not procure the evacuation of the others; but, on the collapse of one, the others came into prominence and were emptied in turn. From each of the larger of the cysts about an ounce of pale serum was withdrawn. After puncture the tumours entirely disappeared.

In another case the mother had noticed a swelling under the right side of the tongue, a few days after birth. On its being shown to the doctor, it was called a "ranula." The swelling grew across the floor of the mouth, and amongst the muscles behind the symphysis of the maxilla, until a definite tumour appeared beneath the jaw. A guarded prognosis was given, and no treatment was suggested. The child was losing appetite and becoming thin. Had any one examined her then, for the first time, he might have experienced difficulty in excluding malignancy from his diagnosis. Later on, the tumour became welded into a solid mass, as if a large abscess were about to declare itself. The inflammation was associated with pain and constitutional disturbance, but on its subsidence, and without the occurrence of suppuration, the growth steadily diminished, and at last was represented by a mere fulness. An hygroma appeared upon the other side of the neck; it grew rapidly, but, like the other (with which it had no apparent connection), it underwent spontaneous inflammation and obliteration. The low vitality of these growths renders them specially liable to inflammation. (The diagnosis from ranula is completed on puncture; for further remarks *see* page 190.)

Treatment.—Like a nævus, an hygroma may cease to get larger, or it may even quietly disappear

without apparent cause. Obliteration may be effected by an attack of spontaneous inflammation. It may, therefore, be advisable to delay active treatment, month by month, until at last interference may be unnecessary. With a tumour containing no evident cysts, the adoption of the Fabian policy has much to recommend it. Cysts may be tapped, one by one, or several of them may be dealt with on a single occasion. Often it is well to tap them at intervals, as, in the meanwhile, the skin shrinks over the diminished mass, and thus the other cysts can be reached with more exactitude. For puncture, an anæsthetic is scarcely wanted. Unless the cysts keep refilling, injection is not needed, and incision and drainage are superfluous. If injection be resorted to, and prove ineffectual, it may become expedient to set up an attack of inflammation in the mass by the introduction of silk setons. As soon as inflammation is started, the setons should be removed, and the mass poulticed. The inflammation may involve considerable shock, exhausting suppuration, convulsions, or even pyæmia; it should be resorted to only in extreme cases. The treatment is speculative, and its complications may prove unmanageable.

The attempt to remove an hygroma by dissection is apt to lead to serious and unlooked-for trouble. On all sides the growth is continuous with connective tissue. It possesses no capsule; even the deep layer of the skin may be incorporated with it. Outgrowths may extend between muscles, nerves, and blood-vessels.

Sebaceous cysts are often met with in the regions of the orbit, forehead, and scalp; sometimes they attain considerable size. The probable mode of their origin has been alluded to on page 127. They differ from the sebaceous cysts of the adult, in that they are generally hard, and are deeply seated. They

are not in the substance of the skin, they may be quite beneath the occipito-frontalis; they are often in connection with the periosteum, or embedded even in the bone itself. The skin moves freely over the tumour, and sometimes the latter may move over the bone. They may retard the ossification of the subjacent skull wall, and to such an extent that complete perforation may exist. They contain a cheesy, sebaceous matter, epidermal tissue, or thin serous fluid; fine hairs may grow in them. Paget describes a congenital sebaceous cyst, in a child of two-and-a-half years, which was situated within the layers of the dura mater, near the superior longitudinal sinus; it contained pearly epithelial cells and a lock of hair. A perforation in the occipital bone opened into a pit, which the cyst occupied, on the inner surface of the bone.

Differential diagnosis.—When placed near the angle of the orbit, they must be distinguished from meningocele (page 177). They are smaller and harder than a meningocele, and of more definite outline. None of their contents can be squeezed back into the cranial cavity, and there is no increase on crying. A small cyst which is partly embedded within the frontal or a parietal bone, and immovably connected with it, may possibly be mistaken for an exostosis, so hard is it. A sewing-needle introduced would reveal the diagnosis.

From a nævus they are distinguished by their hard and regular outline, the absence of discoloration of skin, and the unvarying size, the tumour neither increasing when the child cries, nor diminishing under pressure.

Treatment.—The tumour requires removal by scalpel and dissecting forceps, the skin-wound being made in the line of the natural furrows of the skin, so as to keep the slight resulting scar unnoticeable. The

operation is not always easy. The incision should pass right into the substance of the tumour, the cyst wall being then extracted. None of the cyst should be left behind, lest healing be delayed and the operation be found but partially successful. If the cyst be embedded in the bone, the neighbouring dura mater must not be injured in the extraction. If the wound be somewhat extensive, it may be advisable to place between its edges a filiform roll of indiarubber tissue for the ensurance of drainage. The edges may be drawn together with cross-strapping, rather than with sutures. If redness or inflammation follow, it may be treated by water dressing under oil-silk. Electrolysis and injection of ether are not expedient.

Fatty tumours.—A soft, lobulated, movable tumour in the neighbourhood of thigh, buttock, or shoulder, is probably a lipoma. The differential diagnosis is chiefly from chronic abscess, nævus, and malignant disease. Any doubt as to the nature of the growth could be cleared up at the time of, or subsequent to, the ablation, and it is often expedient to withhold till then a positive opinion as to the nature of the tumour. A lobulated swelling in the middle line of the back must be regarded with suspicion (*spina bifida*, page 243).

Fibromata may occur upon the skin, or in the connective tissue of any region. They are of a benign nature, and are little likely to be influenced by any treatment short of removal. Strange *fibrous nodules* from the size of a shot-corn to a bean, and even larger, are sometimes found just beneath the skin in children with acute rheumatism. They often lie over the bony prominences of the knee, elbow, shoulder, occiput, and ankle. They can be slipped about beneath the skin without causing discomfort, and in due course they may quietly disappear.

Enchondromata occur upon the metacarpal

bones, the phalanges, and at the joint-ends of the longer bones, especially the femur, tibia, and humerus. In these situations enchondroma is an innocent growth. It probably springs from an unconverted island of cartilage in the midst of bone-tissue, or from an epiphysial cartilage.

Treatment need not be precipitate, as the tumour may undergo calcification, and cease to grow. If it were in the way, it might be scraped out from its root, or a phalanx might be removed wholly or in part.

Exostoses consist of cancellated tissue, and are sometimes found at the articular ends of long bones, especially below the head of the tibia. In the Museum of St. Mary's Hospital are some fine examples of exostoses which were removed from a patient after death. A scapula, for instance, covered with spongy stalactite masses which, during life, impinged against the chest and crippled the arm. The father and certain other relations of the boy were similarly affected.

They may arise from calcification of enchondromata; generally they are coated over with a thin layer of cartilage, by which their increase in size is carried on. When this incrustation is calcified, the exostosis ceases to grow. Their origin may at times be associated with a portion of unconverted epiphysial cartilage. Often they are pedunculated, and strangely hereditary; many may exist in the one subject.

Treatment.—They had better be left alone unless they are in the way. If necessary, they may be removed by a small chisel; but, remembering their benign nature, and their frequently close situation to a joint, the surgeon will not urge operation. When they are widely scattered over the skeleton it is obviously unwise to meddle with them.

CHAPTER IX.

NÆVI, WARTS, BOILS, KELOID, ETC.

NÆVUS is a dilatation of blood-vessels; an overgrowth of vascular tissue, capillary, arterial, or venous. It may be situated in or beneath the skin, mucous membrane, or muco-cutaneous tissue; a great number of nævi may exist in different parts of the child. Superficial nævi may be merely flat patches, as in "port-wine mark," without any thickening. They may be associated with much pigmentary staining; or with abnormal growth of hair (nævi pilosi). When upon the surface, and but thinly covered, they are apt to cause serious hæmorrhage.

The arteries supplying a venous nævus are generally small, though sometimes pulsation can be made out in them near the base of the tumour. The veins are dilated, and form blood sinuses, such as those found in ordinary erectile tissue. This expansion of the veins produces absorption of the fibrous tissue of the nævus, so that the tumour may be temporarily flattened by compression. The manner in which nævi grow, cease to grow, become consolidated, or disappear without interference, is peculiar.

When beneath skin or mucous membrane, and not implicating the surface, the **diagnosis** may be uncertain; but sooner or later the superjacent vessels are implicated, and the nature of the growth is clearly revealed. If the increase in size be rapid, the resemblance to malignant disease may become very close. A subcutaneous nævus is likely to feel knotted or spongy, the skin over it showing a bluish tint, from the presence of dilated vessels beneath. A nævus may remain quiescent for a long while after birth, and then assume active growth. When upon the

face or head, it is apt to become turgid when the child cries; its ceasing to do so is suggestive of consolidation, and of approaching subsidence. (For the diagnosis from meningocele see page 177.)

Capillary nævi may be flat or raised, or heaped up into a bright mass like a currant or strawberry. Sometimes the mother is apt to see in them a close resemblance to a mouse or a lobster, and straightway endeavours to associate their causation with some fright or longing which impressed her during pregnancy. An inoffensive nævus which is out of sight may be left without treatment; if it do not fade away, at any rate it will probably cease to grow. An unsightly nævus, or one which has begun to grow rapidly, demands treatment.

Treatment.—Small nævi often shrivel up by the single application of *collodion*; or by two or three applications at intervals of a few days. The contraction of the collodion causes such compression as to squeeze out the blood and prevent its subsequent return. If 10 per cent. of corrosive sublimate be added to the collodion, the application proves more vigorous; it is not suited, however, for painting over a mucous surface.

If collodion fail, *ethylate of sodium* may be tried. This sodium alcohol robs the skin of the elements of water, and the caustic soda which is then left against the tissue quietly destroys it; however, it is of no special value in the surgery of nævi. If *nitric acid* be used, it can be conveniently applied on the end of a lucifer match or a fine glass brush. The healthy skin surrounding the nævus should be smeared with vaseline, as a protection against the spreading of the acid. Occasionally one sees hideous scars which have been caused by the careless application of the acid. In one case there was a cicatricial furrow extending down the cheek, from the scar of a nævus over the

malar bone, the nitric acid having trickled over healthy skin. The bottle containing the acid should be kept well out of the reach of the child's arms and legs.

Pressure is a method of treatment occasionally employed with success, especially when the growth is situated over a surface against which compression may be kept up, as over a cranial bone. It may be exerted by means of a coin wrapped in a fold of lint, and secured by strapping, or by an elastic band which encircles the head, or takes its bearings from a closely fitting skull-cap. If the nævus be large, or if pulsating vessels be entering it, the treatment by pressure is almost certain to disappoint.

A nævus over the anterior fontanelle (a favourite seat), on the eyelid, or inside the mouth or rectum, cannot be conveniently treated in any of the ways just mentioned, but it may be effectually destroyed by *electrolysis* or by Paquelin's *thermo-cautery*. The hot point of the cautery must be directed horizontally, not vertically, over the fontanelle.

Electrolytic treatment.—The decomposition of the nævoid tissue by the continuous current is a satisfactory method of treatment, but if the mass be large and deeply seated, electrolysis is apt to prove tedious. A convenient battery is a Weiss's, of zinc-platinum. The positive pole is connected with a wet sponge, placed upon the skin, while the needle, or needles, in connection with the negative pole, are introduced into the midst, and into the periphery, of the nævoid tissue. A slight blackening or scorching of skin in contact with the needles, and a crackling of hydrogen disengaged within, are signs that all is going well. If the nævus be large, the needles of both poles should be introduced, so that the greatest work may be done in the shortest time. By the passage of the current the tissues are destroyed, oxygen and the

acids collecting about the positive needle, and hydrogen and the bases about the other. These nascent acids or bases, as the case may be, act as powerful caustics and determine a limited gangrene. The sloughs are gradually absorbed, and with slight risk either of ulceration of the skin or of sepsis. If, in his anxiety to hurry on the cure, the surgeon make the sloughs too large, they fail to be absorbed, and suppuration and sloughing are entailed. For a small *nævus* (on the face, for instance) only the negative needles should be introduced. For a large *nævus*, electrolysis lacks the vigour and certainty possessed by the cautery. Two or three sittings, at intervals of a week or more, may be needed ere the growth is destroyed by electrolysis. Nevertheless, if avoidance of scarring rather than rapidity of treatment be desired, electrolysis offers the best means.

The sponge and needles should be previously tested in a little water, to see that the combination of elements is in working order; decomposition of the water demonstrates efficiency. The needles should be made to penetrate every part of the tissue, which thus becomes hardened from the coagulation; they should be gradually and slowly withdrawn, so that not a drop of blood is spilled. Thus the resulting scar is as small as it can be. The operation is prolonged and painful, and demands the administration of an *anæsthetic*.

For *igni-puncture*, the large blade of the thermo-cautery is made to penetrate the mass in every direction, one skin wound often sufficing for the purpose. At once it becomes hard, and soon begins to shrivel; the eschars are detached in due course, and a healthy, granulating surface remains. Water-dressing may be applied throughout the progress of the case, or a saturated solution of carbonate of soda. For small *nævi* the fine blade of a thermo-cautery answers

extremely well, each vessel seen entering at the periphery being obliterated by the red-hot point, and attention generally being paid to the circumferential, and, therefore, the more active part of the nævus.

Excision.—Subcutaneous nævi are often encapsuled, and may be excised by the scalpel without much bleeding. When the mass is being turned out, the bleeding vessels must be caught by the self-holding forceps. If the mass be removed by the scalpel, the incision should be made through unaffected skin; and the vascular tissue having been torn out, and bleeding points secured, the edges may be approximated by suture, a small drainage being inserted for the first day. The scalpel should be carried around the outside of the nævus, and step by step.

Excision is specially suited for the deep nævus in which the skin is but slightly affected. The skin, however, which is affected had better be removed. There is, as a rule, no sloughing or suppuration, such as must occur with the thermo-cautery; and the obliteration is thoroughly effected at the one operation, which could not be obtained by electrolysis.

Until the surgeon has himself excised a large nævus he can scarcely understand how safe and satisfactory the operation is. The great point is to keep the scalpel well beyond the dilated vessels, and, attending to this, he can often enucleate the encapsuled, spongy mass with but an unimportant loss of blood, though the bleeding would be furious should the blade traverse the vessels of the cavernous mass.

When a nævus is to be excised from a limb, Es-march's band may be used. Unfortunately, nævi have not always a capsule, but even when they are comparatively diffuse excision often may prove an excellent method of treatment. The bleeding is not nearly as fierce as might have been expected, and with plenty of catch forceps at hand, the different vessels are readily

secured. The healing is usually prompt, and the scar is comparatively inconspicuous.

The **subcutaneous ligature** I have long abandoned; it is a painful procedure, the effect is secured with sloughing and suppuration. Parts of the strangled mass are very apt to escape obliteration, and have to be attacked afresh, and much constitutional depression attends the discharge. Strangling by ligature around hare-lip pins, inserted at right angles to each other, through the base of the tumour, is not to be recommended. Excision is far better.

Injection of perchloride of iron or other irritant is untrustworthy. I have heard of a case in which the ala of the nose sloughed after a subcutaneous injection of tannin; again, a fatal result has followed the entrance of injected fluid, or of a loose coagulum, into the general circulation. I know of no sort of injection which is either safe or efficient in the treatment of nævus.

Vaccination as a means of removing nævi is more speculative than practical. Hideous scars may be caused by it, though the nævus may have escaped obliteration.

Appreciation of the various methods.—

When a large nævus is brought for treatment, no thought need be given to sodic ethylate, vaccination, setons, or ligature, reliance being placed on the knife, cautery, or electrolysis. And if it be on the face or neck, in which case it is more important to leave the smallest amount of scar, rather than to adopt the most prompt method of obliteration, electrolysis may be tried. But if it be upon the trunk, or upon a limb, it may be thoroughly obliterated by the thermocautery, or enucleated by the aid of scalpel and dressing forceps, and of these methods I incline to the latter.

Concerning the line of procedure for small nævi,

anxious parents may be advised as follows : Except so far as a small *nævus* may happen to cause disfigurement, it is generally harmless, and interference may be indefinitely delayed, perhaps never required ; it may fade away ; and not a few *nævi*, by the pressure or chafing of the clothes, or without external irritation, undergo an attack of inflammation which cures them.

But seeing how quickly speck-like *nævi* may grow into large and unsightly patches, it is advisable to treat every suspicious or threatening spot upon the face or neck before any progress can have been made. For this purpose there is nothing better than the fine point of the thermo-cautery, at a bright red heat. The pain is momentary, the destruction of the vessels certain, and the ultimate disfigurement slight.

A *nævus* must be watched, and its size compared from time to time with an outline drawing previously made ; if it be found to spread, it can be attacked. If a *nævus* be pedunculated, it may be ligatured by a strong waxed thread. If it involve the whole thickness of the lip, it should be attacked from the dental aspect.

Arterial *nævi* are of rare occurrence. Several vessels may be detected, beneath the thin skin, running to supply the mass, and pulsation may be distinct and threatening. In the mass itself, the arteries are elongated and coiled, the veins being insignificant.

Treatment.—They may be treated by electrolysis or the thermo-cautery, but during the latter process alarming hæmorrhage may occur. As an extra precaution, hare-lip pins may be passed through the skin, and under the arterial trunks, and arranged with a twisted suture. The pins may be withdrawn after about twenty-four hours ; but the child would require watching, in case of recurrent hæmorrhage.

Hairy mole.—A child has recently been under treatment whose left malar, infra-orbital, and frontal

region was deeply pigmented, and thickly covered with black hair. The appearance was as of a mole's skin, except that the hairs were long and black. There was also a thick growth of hair on that side of the head. With the hairy scalp itself no interference was undertaken, but the disfigurement of cheek and forehead was treated in repeated operations at considerable intervals with the thermo-cautery. With the red-hot blade, fine parallel lines were scored through the layers of the epidermis, and just into the true skin. The cauterisation was still further increased by cross lines where the pigmentation and hair were blackest. The crops of hair which grew after operation became lighter and lighter, and the disfigurement faded in the most marked degree. There ensued no puckering of the skin, or retraction of eyelid. There is no reason why a small hairy mole should not be removed by the scalpel, if its presence cause disfigurement; but probably the better line of treatment will be with the use of the thermo-cautery. The treatment must, in any case, be effectual, and should never degenerate into mere irritation or excoriation. Moles may, later in life, become the starting point of malignant growths. Of this I have met with a characteristic example.

Port-wine stains of the skin may be dealt with in a manner similar to that detailed above, or they might be patiently treated by electrolysis. Oft-repeated puncture with the needles of the negative pole (page 137) could hardly fail to render the discoloration paler, even if it did not entirely efface it; but for rapidity and thoroughness of treatment, the benzoline cautery is to be preferred. The finest point, raised to a white heat, is to be lightly stabbed just into the true skin in a deliberate and regular manner. No bleeding occurs. A dressing of wet lint and oil-silk is applied. The tissue worked upon is for some months afterwards hyperæmic, but the cutaneous blood-vessels

gradually contract, and the part eventually becomes even whiter than natural. But before adopting this treatment, or in cases in which, though recommended, it is declined, a trial may be made of ethylate of sodium (page 136).

Lymphatic nævus is similar in its nature to that of the blood vascular tumours just considered. It may be observed at birth, or may take on growth subsequently. Should the network of dilated lymphatics infiltrate the skin of a limb, great hypertrophy may result. As affecting the lip (macrochelia) and tongue (macroglossia) the disease is considered on pages 201 and 200. When a **limb** is **hypertrophied** by general lymphatic dilatation, carefully regulated compression by Esmarch's band may effect a cure.

Warts (verrucae) may be solitary, or in clusters. Sometimes they are caused by local irritation; sometimes there is no apparent cause for them. They consist of enlarged, branched papillæ, upon which epidermal scales are closely packed. They are homologous growths, but are to be distinguished from the rounded and moist elevations of constitutional syphilis, condylomata. These latter generally grow near a muco-cutaneous surface, but sometimes they are found about the thighs, elbows, or tongue (Plate III. Fig. 1). Warts may be treated by keeping them thickly covered with diluted red mercurial ointment, or by glycerine which has been saturated with salicylic acid. Fowler's solution should be given in small doses. If their removal in this way do not succeed, they may be touched with glacial acetic acid, or with chromic acid. A pedunculated wart may be made to slough by strangling its base with a waxed silk or thread. Warts upon the fingers, due to the irritation caused by the frequent contact with subpreputial discharge, will disappear soon after circumcision has been performed. Onanism is said to be occasionally the cause

of warts on girls' fingers. In any case, warts usually disappear at, or soon after, puberty.

Molluscum contagiosum, or sebaceous wart, is a common affection. The tumours vary in size, from a minute speck to a pea; they may be still larger; often they are clustered. They are most frequently met with on the infant's face; and as tumours of an exactly similar nature may be found, at the same time, upon the breast or face of the mother, or on the face of some other member of the household, the contagiousness of the disease would seem probable. A dark spot is generally to be seen in the centre of the growth. They are well shown in Plate IV. Fig. 2.

The **pathology** is unsettled. According to some, the tumour is the result of a distension of the sebaceous glands with accumulated cells; others consider it to be an epidermal growth, starting in the hair follicles, or in the rete Malpighii. The tumours seem to be made up of nests of epidermal cells, in which lie characteristic bodies like swollen starch grains.

The **treatment** consists in squeezing the little tumours between the thumb-nails; or they may be snipped off by a pair of fine scissors. It is unnecessary to touch with caustic the small wounds thus made. It is not expedient to remove all the tumours on the one day if the child suffer much pain therefrom, for it is hardly necessary that an anæsthetic be administered for the little operation.

Boils (furunculi) are caused by acute inflammation attacking a limited portion of skin. Generally, the inflammation begins at a sebaceous gland, or a hair follicle; death quickly follows in the minute piece of tissue thus implicated. Eventually the small gangrenous shred, "the core," is cast off. Until the boil breaks, or the inflammatory tension is relieved by puncture, the child may suffer much, both locally and constitutionally. The usual seats for boils are the back of the

neck, knee, buttock, the arm-pit, and eyelid. In the last-named situation the inflammation begins in connection with a meibomian follicle, the disease being then called a **stye**. In some few cases boils may be the result of dirt, or other irritation; generally they may be taken as evidence of the child being out of health. The boy who is home from school, and eats, drinks, and sleeps more than he has been accustomed to do, and more than is good for him, is apt to break out in boils; so also is he whose diet is insufficient, and whose general tone is depressed.

Treatment.—A change of diet is likely to be beneficial; thus the over-fed subject should be supplied with less, and the poor-looking and underfed one put on a liberal diet of meat, with beer or wine. Iron and quinine tonics, or the laxative iron tonic, may be prescribed. Sulphide of calcium is of doubtful value, so also is yeast. A change of air may be found of great efficacy. The condition of the urine should be inquired into, and the bowels kept well open.

Local measures.—The acutely inflamed and tense tissues may be relieved by puncture with a lancet, the wound being then dressed with a scrap of lint of the size of a sixpenny piece. This may be dipped in a weak solution of carbolic acid, and then covered over with a piece of oil-silk of rather larger diameter. Poulticing is apt to set up irritation, and to determine the outbreak of crops of smaller boils. The adjoining tissue should be smeared with vaseline, to prevent inoculation of the adjacent hair-follicles by the micro-organisms, whose pressure probably determines the disease. Acting on this pathological hypothesis, it is well to touch each inflamed spot with a strong solution of carbolic acid (1 in 4) on a pointed match.

Keloid is a pinkish outgrowth of fibrous tissue, starting from a recent cicatrix; though it may be unsightly it is innocent and painless. If dissected out it

may be replaced by a similar growth ; if left uninterfered with it may gradually dwindle. I am not in favour of interfering with a keloid, at any rate, not before puberty, for the new fibrous tissue of which it is composed is almost sure to undergo contraction in due course, squeezing and emptying the vessels, and marking the area at last with a small white scar.

CHAPTER X.

HYDRO-THORAX AND EMPYEMA.

Hydro-thorax.—As a result of inflammation, serous effusion may take place into the cavity of the pleura. It is only when the amount of effusion is excessive that surgical interference is called for. Then, the earlier the fluid is drawn off the greater the chance of the lung tissue completely recovering its function.

Signs.—When the pleura is full of fluid, the lung is emptied of air, and is compressed against the vertebral column. There is, therefore, a complete absence of breath sounds over the basal, anterior, and lateral regions of that side of the chest. The percussion note is absolutely dull ; and when the hand is laid flat upon the ribs, and the child coughs, cries, or speaks, no vocal vibration can be detected, the sound-waves being cut off by the intervening fluid. On listening between the scapulæ, air may be heard entering the bronchial tubes. The heart may be considerably displaced, especially if the collection be upon the left side, the apex beating far from its normal situation, which is just below and to the inner side of the nipple. The side of the chest appears abnormally full, and the intercostal furrows may be effaced. That side of the

chest does not move with the other, and as the one lung has to do the work of two, the respiration must needs be greatly quickened. The circulation is also embarrassed. The child naturally lies upon the water-logged side.

Differential diagnosis.—The signs are not always as clearly marked as above recorded. From consolidation of the lung, the diagnosis will be made by the history of the case. By there being some vocal fremitus, and tubular breathing in the case of consolidation; by the absence of increased fulness of that side of the chest, and by persistence of the intercostal furrows. Notice also will be taken of the character of the sputum. From malignant disease the diagnosis is not always easy. In some cases it can be effected only by an exploratory puncture with a trustworthy hypodermic syringe, or a larger apparatus of special make—the exploring syringe.

PARACENTESIS THORACIS.

The apparatus used will be a fine canula and trocar, or an aspirator; in either case the point of the instrument must be sharp, so that it is certain to pass through the thickened and tough parietal pleura. The instrument must be perfectly clean; and if the aspirator be employed, the operation had better be previously rehearsed with hot water, for the piston may be too tight, or require more “packing;” taps may be stiff, or their working not perfectly understood, the needle may be stuck in the canula, the indiarubber tube may be leaking, or some joint may not be air-tight. The complete aspirator of Dieulafoy may be used, but the simpler one, which is extemporised out of an ordinary wine bottle, is quite as serviceable, and it is less likely to get out of order. Porritt* recommends a piece of indiarubber tubing, of $\frac{3}{16}$ in. bore, and long enough to reach from the patient's chest to the floor.

* Fothergillian Prize Essay, 1883.

The lower end is weighted with a piece of lead, so that it may remain beneath some carbolic solution in the vessel in which the fluid is to be received. The other end is secured to one of Dieulafoy's open canulas, not less than three inches long. The trocar is made to enter the canula by being thrust through the tubing close to the canula. Each part of the apparatus is first cleansed with carbolic lotion. As soon as the trocar is withdrawn, the puncture in the wall of the tubing is obliterated, and the paracentesis is conducted with perfect antisepticity. It is advisable that a canula *with a trocar* be used, as the combined instrument is stronger than a simple hollow needle. Moreover, if the latter instrument be used, its sharp point must remain in the pleural cavity during the whole time of the operation, whereby the lung tissue itself may be damaged. The canula should be a fine one, of about the size of a No. 1 (English) catheter. A fine one is less likely to do harm, and less likely to be blocked by lymph flakes, than the larger one. If a canula without a trocar be used, its orifice may get blocked as it is entering the cavity.

As regards the admission of air during the operation, Porritt rightly suggests that though some authors may not regard the admission with disfavour, still, as no one has yet ventured to affirm that it is beneficial, the operator must give the patient the benefit of the doubt, and carefully exclude ordinary atmospheric air from the cavity. He is opposed to the use of Southey's trocars, as they have to remain a long while in the chest, and their presence is apt to be associated with the entrance of air. Unless the child be very apprehensive, chloroform need not be administered. The skin may be rendered anæsthetic by the application of a small piece of ice which has been dipped in salt, and surrounded with a single layer of linen. No preliminary incision is needed, but if a slight one be desired, it should be made over the upper border of

the rib, so that, as the needle is thrust inwards, the intercostal artery may not be wounded.

The **site of puncture** should be just in front of the inferior angle of the scapula, so that the diaphragm may be out of reach of the end of the needle. The pleural cavity will not be completely emptied by the one aspiration or puncture, but very likely after the chief part of the fluid has thus been withdrawn the rest will be quickly absorbed.

The child should be propped up in bed, brandy should be at hand, or ether, for subcutaneous injection, in case of faintness supervening. The skin having been blanched by the ice and salt, the sharp instrument is to be thrust into the chest close over the upper border of the lower rib. It must be sent in with a short, sharp plunge. If the end of the index finger be fixed on the instrument, at about an inch and a half from the point, it is unlikely that the lung will be wounded. As the serum ceases to flow, the tube is withdrawn; if a simple canula be used the end should first be blocked with the finger, so as to keep air out of the cavity; the entrance of germs might cause the remaining serum to become purulent. If the aspirator be used, the vacuum must not be very thorough, lest the expanding lung wound itself against the eye or the end of the tube. The lung may be sucked over the tube, then its surface capillaries are ruptured, and the escaping fluid is blood-stained. If a canula and trocar be used, the canula must be withdrawn just when the flow begins to get irregular. In rare instances air leaks into the wound, and, being pumped onwards by the respiratory movements, emphysema is a temporary result.

Sometimes, even if no air have entered the cavity, suppuration quickly follows the operation; rarely in childhood does the fluid remain clear and limpid. Occasionally, after the tapping, the lung expands

forthwith, the thoracic troubles entirely disappearing. In other cases the favourable result may follow after repeated punctures. If it be uncertain whether the fluid in the pleural cavity is serous or purulent, an exploratory puncture may be made with the fine needle of a hypodermic syringe. This may be resorted to without hesitation, but care must be taken lest a sudden movement of the child cause the needle to break off short.

A cough which is apt to occur as the fluid escapes, shows that the lung has not lost its power of re-expansion. The cough tears through adhesions, and is, therefore, beneficial "within reasonable limits," but if the child continue to cough, or if blood appear in the fluid, the canula should be withdrawn.

Fallacies.—Although the chest may contain much fluid, the aspirator is occasionally unable, even in childhood, to effect its withdrawal. This may be due to the fact that the lung is solidly compressed against the spinal column, and unable to expand; that the diaphragm fails to rise, or the chest walls to fall inwards; and in varying proportions all these conditions may obtain at the same time. The end of the needle may be manifestly free in a large collection of fluid, and the aspirator may be in perfect working order, yet little or no fluid escapes on setting the apparatus in train; to obviate this, Parker has suggested that carbolised air be pumped into the upper part of the pleural cavity, to replace the fluid drawn off from the lower part. In the case of consolidation or tumour of the lung there may be a little serum in the pleura, as the hypodermic syringe may evince, but not enough to serve the large aspirator. Care must be taken that every joint of the instrument is air-tight. Sometimes, as is demonstrated by the subsequent introduction of the finger, the cause of the dry tapping is a tough veil of organised lymph, hung as a lining to the

pleura, which the trocar, failing to traverse, pushes before it into the fluid. Therefore, the instrument should not be allowed to become blunt.

Empyema.—A simple hydro-thorax is very likely to become purulent in time, and if, on making an exploratory puncture, it be found that the pleural cavity contains pus, interference is urgently demanded. Certain symptoms may possibly have already made the medical attendant suspicious of the nature of the fluid, such, for instance, as shiverings, or even convulsions, the elevation of temperature, and the increasing distress. As a tentative measure, aspiration may be adopted, for though the cavity cannot be completely emptied by this process, yet the removal of a certain amount of the fluid may be the means of promoting the rapid or gradual absorption of the rest. Sometimes even a single tapping suffices to establish convalescence. And if the area of dulness extend again after the operation, a second or a third puncture may be tried ; but if the punctures require to be made at short intervals, say of a day or two, the probability of a successful issue from this simple treatment is remote. If a child show but little or no real improvement after the tapplings, continuance of that treatment must not be persisted in ; but the pleural abscess (for such it is) must be treated on the principles which guide us in dealing with a collection of pus in any other cavity. Thus, free incision and drainage are demanded ; but aspiration should always be first afforded a fair trial, for, serviceable as the open method is, we must not lose sight of the fact that chronic discharge from a large abscess cavity has various and grave attendant risks. (*See page 157.*) The longer the delay in evacuating the pleural abscess, the greater the risk of the lung being glued to the back of the chest and being rendered completely and permanently useless.

If the collection of pus remain uninterfered with it may **discharge itself spontaneously**, through an intercostal space, or a bronchial tube; or it may burst through the diaphragm and give rise to fatal peritonitis. Speaking of the spontaneous opening, West remarks that the pus is discharged almost invariably through the fourth or fifth interspace, and a little outside the nipple. Farther on, also, in discussing the value of the operation of tapping, he says that he has in no single instance regretted its performance, but that he has often been sorry that he had not resorted to it sooner.

The **site for the operation** varies in the case of an encysted empyema with the situation of the abscess, the primary exploration being made, of course, in the area of greatest dulness. But in the case of a general pleural abscess, the **seat of election** is just in front of the angle of the scapula, the arm being down to the side. It is unnecessary to count the ribs to find out exactly which intercostal space is about to be traversed; it will most likely be the sixth. It is not advisable to make the opening lower down than this, especially when operating on the right side, for, as the abscess-cavity contracts upwards rather than downwards, there would be a risk of the ascending diaphragm obstructing the end of the tube. The evacuation of the cavity is not accomplished merely under the influence of gravitation; were it so, the tube should, of course, be introduced at the very lowest part; the pus is got rid of by the expansion of the lung and the ascent of the diaphragm, and partly by absorption.

The chloroform should be cautiously administered, the breathing being carefully watched, for respiration is being carried on entirely by one lung. The child should be placed flat upon his back, and before operating the skin should be thoroughly cleansed.

An exploratory puncture at the spot is made with a fine trocar and canula, and a grooved director is passed along the track into the pleural cavity. Along the groove a probe-pointed bistoury is then thrust, and an incision about two inches long is made through the space. This incision is subsequently enlarged by thrusting in the end of the finger, and working it along between the ribs.

The scalpel should be used only for dividing the structures down to the depth of the intercostal aponeurosis, the wound being carried farther inwards by employment of director and dressing forceps, after the manner of Hilton (page 272).

If the intercostal space be so narrow as to offer little prospect for the easy introduction of the tube and the unobstructed escape of pus through it, it is advisable there and then to **resect about an inch of one of the ribs** at that situation. This is best done by detaching the periosteum by a strong director or elevator, at the same time isolating the rib from the intercostal vessels. The bone is then cut through in two places with a pair of pliers, and the resected fragment is picked out. It is a simple procedure, and often a very necessary one; the instruments needed for it should, therefore, invariably be at hand when an empyema is to be opened. The pliers, or even scissors, serve for dividing the rib, and if the bone have first been isolated, as I have described, there is practically no risk of bleeding.

I would like it to be clearly understood that I do not advise the resection as a routine practice, but the surgeon should always be prepared to perform it. And if there be any doubt about the practicability of the intercostal space for free drainage, he had better adopt it as a primary measure, rather than run the risk of having to come back to it some days or weeks later, because the cavity is not draining properly, and

the child has a high temperature, and is altogether doing badly. In every case, the first indication is to have an opening through which even large flakes of lymph can escape, and which admits of the subsequent removal and re-introduction of the tube without hurting and alarming the child. The free entrance of air into the pleural cavity is advantageous, in that it affords support to the lung tissue, and thus shields it from consecutive engorgement. The thorough drainage prevents retention and decomposition.

The "anchor-drain," which I am in the habit of using, is made by taking a couple of inches of a stiff indiarubber tube, of about the circumference of a cedar pencil, splitting the last quarter of an inch into four equal segments, and passing the split end through a hole in a piece of mackintosh sheeting about an inch and a half square; the four segments are then stitched flat upon the mackintosh by silver wire. The tube thus arranged cannot drop into the pleura, its outer end remains wide open, and the absorbent pad placed over it keeps it from slipping out. As the discharge diminishes, the tube is made more slender and shorter, and even before the discharge has absolutely ceased it may be left off. If, after the surgeon has finally removed the tube, the temperature should ascend, and there should be other evidence that some purulent fluid is locked up, he can easily break through the track and, if necessary, re-introduce the tube for a while. But from what I see of the use of drainage tubes in my own practice, as well as in that of others, I am sure that harm is more likely to arise from a tube being left in too long than from its being taken out too soon.

The layer of the pleura which is bathed with pus behaves like the surface of an ordinary ulcer; it covers itself with a stratum of granulation tissue which may eventually be converted into fibrous tissue, thickening

the original pleural wall. Or, coming into contact with an opposed surface of the membrane, which is also granulating, the two layers may become joined by firm, fibrous adhesions. A thickened and rigid pleura helps to prevent expansion of the lung in those cases in which the opening of the abscess has been delayed.

The **dressings** should consist of bulky pads of sublimate wood-wool in gauze bags. They should be kept in position by a wide strip of linen which is long enough to meet round the front of the chest, there to be fastened by a few safety-pins. If the discharge be offensive, finely-powdered iodoform may be dusted over the pads.

Irrigation of the cavity should not be resorted to as a routine practice, but may be advantageously adopted when the discharge, though sweet, is extremely profuse, or when, though, perhaps, moderate in quantity, it has become putrid. For this purpose, neither corrosive sublimate nor carbolic acid in solution is safe, on account of their toxic effect when absorbed. Warm iodine-water, decolorised by a little carbolic acid lotion, or hot boracic solution answers well. The fluid may be injected by fixing a French catheter on to the end of the indiarubber tube attached to an irrigator.

Care must be taken that the drainage tubes are securely attached, as they are very apt to get adrift into the interior of the thorax. Battams has an ingenious plan of fixing them (Fig. 15). He takes a piece of thick indiarubber tubing (without lateral perforations), of about the circumference of a cedar pencil; in the middle of this he makes a longitudinal slit of about three-quarters of an inch. Through the slit run the afferent and efferent drainage tubes,

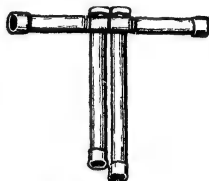


Fig. 15 — Irrigation
Tubes for Putrid
Empyema.

which are thus securely grasped. But to make the join safe, he twists a piece of fine metal wire several times around between them, so that each is held in a separate grip. The ends of the tubes he then rolls inside out for about a quarter of an inch, so that they may be kept wide open ; and as the collars thus made lie against the outer side of the cross tube, slipping is absolutely impossible. For irrigation a connection is easily made between these tubes and the others which bring the fluid into the chest and take it away again.

Tube loose in chest.—Occasionally one is called to extract a tube from the pleural cavity. On slightly enlarging the wound, wedging the ribs asunder (perhaps with necrosis forceps), and searching the cavity with the finger, the tube may generally be found, and extracted with forceps. A speculative search with forceps alone is apt to be unsuccessful, but it may be cautiously tried before more energetic means are resorted to. A flushing of the cavity with a warm antiseptic solution might be the means of bringing the tube to the opening. Neither probe nor forceps can recognise by the touch an indiarubber tube.

Resection of portions of the ribs has to be adopted in the after treatment of certain cases, when the lung has remained collapsed and bound to the spine, and chronic pleural discharge has failed to diminish. The operation is resorted to in order that the rigid chest wall may fall in and obliterate the cavity. In young children, a natural obliteration of the cavity must duly take place, certainly, though sometimes slowly, by the falling in of the chest wall, the incurrence of a certain amount of lateral curvature, the elevation of the diaphragm, and the expansion of the opposite lung. And unless the evacuation of the empyema have been long delayed, and the lung

be irretrievably damaged, the division of a series of ribs is not likely to be needed.

Careful attention must be paid to *diet*, and wine should be liberally administered. If necessary, extra food may be introduced into the stomach by the œsophageal tube (page 52). The drugs required will be quinine and iron, and, perhaps, small doses of opium. And as soon after the operation as possible, the child should be got out of bed and into the fresh air. Indeed, gentle exercise may be good in helping the lung to expand again; it may be permissible long before the wound has ceased to discharge. It is surely an error to confine the child to the sick-room, or even to the house, simply because he has a pleural abscess.

Prognosis is for a time uncertain. The abscess cavity may quickly contract, especially if the evacuation have not been long postponed. But exhaustion, pyæmia, tuberculosis, or amyloid disease may intervene and prove fatal.

CHAPTER XI.

BURNS AND SCALDS.

BURNS and scalds are serious injuries in childhood; they may cause death by shock, exhaustion, tetanus, lung disease, or blood poisoning.

Children are sometimes badly scalded from being incautiously plunged into a hot bath when seized with convulsions, from the application of over hot poultices, and from the upsetting of a tea-pot. Extensive injury and shock have followed on a child being made to sit over a chamber-vessel containing hot water, for the relief of chronic constipation; such a case is at

the present time under my charge, with extensive ulceration of each buttock. The child is kept lying prone.

Prognosis is most unfavourable when the burn is about the pelvis, abdomen, or thorax; this may be on account of the close proximity of extensive plexuses of the sympathetic system. When as much as one-third of the surface of the body has been burnt, recovery is highly improbable; prognosis may thus depend upon the extent of skin injured as well as on the area which the destructive action has affected.

(For burn of glottis *see* page 242.)

Treatment.—If a child's clothes were ablaze, and he have been wrapped in table-cloth, coat, or rug, he had better not be disturbed until chloroform has been administered. The anæsthetic allays fright, and diminishes shock. The clothes should then be cautiously removed, and each burned and scalded part dressed; and after this, the less that the part is disturbed the better. To diminish the effects of shock, hot bottles wrapped in flannel may be tucked in the bed, and warm drinks given. No one should be allowed at the bed-side but the nurse on duty, for quiet is of vital importance.

Wine should be given at short intervals, with milk or egg, and morphia should be administered in small, repeated doses. Bromide of potassium will be indicated if convulsions supervene, but even then confidence may be placed rather in the morphia; castor oil may be required. The intense thirst may be partially allayed by the sucking of small pieces of ice, and by draughts of soda-water and fresh lemon juice, with sugar and ice. Children are especially fond of fresh fruit when they are feverish, and it is generally good for them.

Local treatment.—Each dressing should be carried out so as to cause the least pain and

apprehension. Carbolic acid solution (1 in 40) is a valuable application, as the drug keeps the wound aseptic and deadens the sensibility of the nerves. Linen soaked in it may be applied under oil-silk, so that evaporation cannot take place, nor the dressings become dry and adherent. Additional quantities of the lotion can be introduced by a small syringe, but watch must be kept against carbolic acid poisoning (page 465).

Lint thickly spread with vaseline and eucalyptus may be laid on a scorched surface, and over this a padding of cotton-wool bandaged. If the dressings stick to the surface, they must be slowly and cautiously removed by syringing with warm carbolised water.

If the burn be deep, the dressings require more frequent changing. Rags wrung out in eucalyptus oil and water, or solution of boracic acid, may be applied under oil-silk. If the child be in pain, chloroform may be administered for the first few dressings. Carron oil is not so satisfactory an application as those mentioned above. I have not experienced much benefit from the use of saturated solutions of carbonate of soda.

Dusting the denuded surface with flour from a kitchen dredger forms a thin protective cake over the exposed nerve filaments, and shields them from the air. As serum oozes up, or detaches the crusts, fresh flour may be dusted. Air is a great irritant; a burnt surface should be exposed to it as little as possible; at the dressing, one part should be covered up before another wrapping is undone. The more thorough the rest of the part the more rapid is the healing—the neck should be steadied between large sand bags; the limb should be fixed by a splint or a weight (Fig. 75).

If a limb be deeply charred, it may be expedient to amputate it forthwith, as the process of ulceration

and suppuration is tedious, and the child is apt to sink from the exhaustion which it entails, or from the effects of a broncho-pneumonia, which is probably pyæmic in its nature. Congestion of the brain and its membranes is associated with excitability and succeeding coma. Erysipelas and traumatic fever may supervene; indeed, the latter condition must be anticipated, and combated with stimulants and opium. The erysipelas may be treated by common white lead paint, or by covering the surface with the liniment of lactate of lead.

Shiverings may be the result of direct injury to the nervous system, or they may be of pyæmic origin. Chronic and foul ulcers may be dusted with iodoform; and their persistence may eventually demand amputation of a limb. Blebs should be opened up, the denuded surface of skin being dusted with iodoform, as an antiseptic measure.

Deformities will follow the healing of extensive burns. It is often said that the cicatrix after a burn contracts more than any other kind of scar; probably the true explanation is that this cicatrix is usually more extensive than that left after any other injury, the contraction being proportionately great. The elements of the scar tissue cannot be influenced by antecedent conditions. The contraction of a scar at the front of the neck may drag the inferior maxilla down to the chest, and prevent its proper development; the lip is effaced, the teeth come through irregularly, and the saliva constantly dribbles away. Attempt to improve the disfigurement is likely to be disappointing, as the adjacent skin is apt to be unsound and intolerant of interference. All that can be contemplated will probably be an operation for supplying a lip out of the healthy tissues of the cheeks. If the burn be at the back of the knee the leg must be kept constantly extended by a stirrup and weight,

provided that the tissues above the ankle be sound enough for the attachment of strapping. For a raw surface down the front of the neck, cicatrisation may be quickened and deformity checked by the continual wearing of the collar shown in Fig. 37.

If the burn be limited to the front of the knee, the leg should be kept flexed, so that when the scar is contracted to the utmost, full flexion may be still permitted. If the burn be in the groin, the child may be placed upon a Thomas's hip splint. If at the front of the elbow, the limb should be kept extended; whilst if on the salient angle, the fore-arm had better be flexed. Like principles should guide one in dealing with a burn about the shoulder, arm-pit, wrist, or finger. If the opposed surfaces of the fingers or toes be granulating, they should be preserved from mutual contact by strips of lint, smeared with vaseline and eucalyptus, or some such dressing. If the nose be burnt, a short piece of drainage tube should be fixed in the nares during the cicatrisation.

When an arm is bound to the side by cicatricial bands, or an elbow or other joint is permanently flexed, plastic operation may afford some improvement, but subsequent contraction of the new scar-tissue is certain to follow. The tissues in the neighbourhood of a cicatrix are rarely available for plastic operations, whilst flaps transplanted from distant parts often fail to take root in the scar tissue prepared for their reception. The result of interference with contracted cicatrices is generally disappointing, even when the after-treatment bestowed upon the case has been patient and prolonged. Fingers or toes which are curled round may require amputation. And so also a hand, foot, arm, or leg which is greatly deformed, seriously in the way, or covered by an extensive and intractable ulceration, may demand amputation. Constant exercises of the limb with gentle frictions and

shampooings of the tender tissue, will ensure the greatest amount of suppleness for the scar; but care must always be taken lest the friable scar-tissue give way, and an intractable ulceration follow. The healing of healthy ulcers may be accelerated by skin grafting; for this purpose minute chips of healthy skin which has just been removed at a circumcision may be made available (Lucas).

Keloid growths are apt to form in the cicatrix left after a burn. (See page 145.)

CHAPTER XII.

INFANTILE PARALYSIS—PSEUDO-HYPERTROPHIC PARALYSIS—TETANY—SPASTIC PARALYSIS—NEUROMYOMESIS—SPORADIC CRETINISM.

IN the early days of **infantile paralysis** the diagnosis may be obscure; the surgeon may be called in to give assurance that the suddenly helpless condition of a limb is not the result of some recent and severe injury. In the later stages of the disease, when paralysis has been followed by deformity, the case may be considered as purely surgical. The early diagnosis of the disease is often overlooked.

Pathology.—The nerves which govern the nutrition, and regulate the movements of the muscles, of the extremities, are associated with large, multi-polar cells in the anterior horn of the grey matter of the spinal cord. (Anterior polio-myelitis; *πολιός*, "grey;" *μυελός*, "marrow.") When acute inflammation attacks his grey tissue, the function of its vesicular elements is interfered with; and if a considerable extent of the grey column be implicated, many muscles are thrown

out of working order. Should extravasations of blood take place, the destruction of the cells, and of the delicate fibres associated with them, may be irremediable, the paralysed muscles becoming quickly and permanently wasted.

Clinical history.—The paralysis may come on without warning, or it may be preceded by a short feverish attack, or convulsions; it may be accompanied with pains and tenderness in the limbs.* Sometimes the attack is associated with vomiting. If, as often happens, the child be cutting a tooth at the time, the premonitory symptoms may be attributed to “dentition.” If, unfortunately, the nature of the illness be not recognised, the medical attendant may find himself blamed when, later on, as the child begins to crawl about again, paralysis is discovered. Such blame is unreasonable; but the practitioner who is prepared to read the warnings of paralysis is least likely to be surprised. As a rule, more muscles are at first affected than are ultimately left paralysed. This is due to the disturbance of certain outlying cells by hæmorrhage or by inflammatory exudation being only temporary. In one case, all four extremities were paralysed; gradually the arms recovered, but both thighs and legs have remained useless, in spite of treatment. When only one group of muscles in a limb is left paralysed, deformity is produced; thus, on the inner tibial muscles being atrophied, spurious talipes valgus may ensue. (*See page 523.*)

Groups of muscles in a limb may be paralysed, whilst others may be but partially affected, or entirely escape. Favourite groups for permanent paralysis are those of the extensors of the toes and flexors of the ankle. In no case is sensation diminished; sometimes, indeed, it is exalted. Infantile paralysis affects the

* “Muscular Atrophy,” by Allen Sturge; *Proc. of Med. Soc. Lond.*, vol. v.

lower extremity more often than the upper, though a "wasted arm" or deltoid is of no infrequent occurrence. Atrophy quickly supervenes, not simply from want of exercise, but from damage to the nerves which govern nutrition. The flabby, wasted muscle no longer responds to the interrupted current, though imperfect movements may be excited by galvanism. The excito-motory loop being broken on account of the damage to the ganglionic cells, the reflexes of the affected region are abolished. Ulcers are apt to occur on the wasted limb from slight pressure, especially in cold weather.

Prognosis.—Fortunately, permanent paralysis is rarely so extensive or complete as it threatens to be at the onset of the attack; after the explosion in the grey matter, the alarm is often great, and the apprehensions serious; the case is, however, almost sure to improve to a certain extent. I have lately had under supervision a child whose left upper extremity suddenly became painful and motionless; after a few days the muscles gradually regained power, and at the beginning of the second week the effects of the attack had completely passed away. Generally, however, some one or more muscles will be left enfeebled or useless. The sudden and transient paralysis is explained by the attack of myelitis having been arrested in the stage of congestion; and thus it is understood how when certain muscles are left permanently useless, others steadily regain power.

As regards the prospect of ultimate recovery, valuable information may be obtained by the use of the continuous or interrupted current. If, under stimulus, the contraction can be excited, even though the atrophy be extreme, recovery may be looked for. For some days or even weeks it is better not to commit oneself to any definite expression of opinion as to restoration, but one may always look forward with hope

for material improvement. In the case of paralysis in the thigh and leg it is an excellent augury when patellar tendon-reflex persists, as this shows that the large bi-polar cells in a very important region of the cord have escaped wreckage.

The **differential diagnosis** is not always easy, and in the earliest hours, or days, of the trouble, it may be impossible to give a positive opinion on the case. Thus, in the obscure illnesses of children one must always speak with caution, and, while taking care not to give unnecessary alarm, hold oneself open for serious contingencies. Certainly, one should not rest content with the acceptance of the suggestion of the nurse, or mother, that the illness may be the result of teething. It is well to be continually on the watch against the insidious onset of infantile paralysis.

The tenderness which lingers about a limb which has been implicated in essential paralysis is apt to mislead. An infant of fifteen months was brought for treatment on account of "hip-joint disease." Some months previously it had had an attack of "bilious fever," with, evidently, pains in the head. Soon after this an orthopædic surgeon was consulted. The child did not move the left lower limb, as it did the right, and cried when the leg was roughly handled; a heavy apparatus was fitted; but it was soon discarded. The child was rickety; the left leg and thigh were weak and flabby. On carefully rotating the thigh, so as gently to rub the head of the femur in the acetabulum, no signs of distress were evinced. There was no fulness in the fold of the groin, nor was there that other characteristic sign of the joint trouble, flexion of the limb. (See page 430.) Infantile paralysis was therefore diagnosed, and particular instruction was given that the limb should be kept warm. Regular employment of massage was also to be thoroughly carried out, and cod-liver oil inunction was to be used. In a few weeks

the child was able to walk a little, though he still dragged the limb. With hip-joint disease the limb would have been advanced, not dragged. The subsequent progress was satisfactory, and the muscular weakness entirely passed away.

Treatment.—The gums may be inspected, and the bowels cleared by a dose of rhubarb and soda, or grey powder. The fretful child must be nursed, petted, and kept warm; it may not be expedient to confine him to bed. Small doses of bromide of potassium may allay irritability; leeches, a mustard poultice, or a stronger irritant, may be placed over the cervical or lumbar enlargement of the cord, as the case may be. But until tenderness has disappeared from the limb, and the general disquietude has passed away; and until it has become evident which muscles are affected, electrical treatment should not be resorted to. Nor is it advisable to worry the child with electricity, for the purpose of diagnosis, until his health is re-established, and all tenderness and apprehension have passed away.

The development of the limb is affected and the circulation is slow; the limb should, therefore, be enclosed in a thick stocking or sleeve, the interior of which may be lined with a layer of lamb's wool. Frictions, in front of the fire, may be performed at frequent intervals during the day, by rubbing the hand in the direction of the venous return. The mother or nurse may be instructed in the principles of massage, and more faith may be placed in this valuable aid than in electricity. The treatment must be persisted in, if necessary, for months or years. "Much good often results from putting the child in a 'go-cart,' where, in order to move about, the affected muscles must be called upon to act." *

If the child possess sufficient intelligence, he must be made to try to set the feeble muscles in

* Holmes, "Principles of Surgery," p. 468. 2nd edition.

action by force of will. This is a very valuable measure. His games and toys should be arranged with a due regard to this matter.

The continuous current will serve to assist nutrition until the central damage has been repaired. Later on, the interrupted current may be used, the electricity being just sufficient to produce a visible effect. Iron and strychnia may be prescribed, and the limb rubbed with oil. Too much reliance must not be placed upon electricity alone. When atrophy and deformity are established, no treatment can serve; electricity cannot restore a connection between nerve fibre and cell, nor create fresh elements in the damaged cornu of the grey crescent. Improvement, excepting in those muscles which are already in progress of amendment, can scarcely be hoped for after the lapse of eight or ten months from the commencement of the disease.

For the treatment of deformity from paralysis, *see* page 524.

For paralysis of the flexors of the ankle, every effort should be made to prevent the foot becoming extended to more than a right angle, or the toes will be in the way during progression. Frictions and manipulations may do much towards preventing this deformity; but a stiff boot, or even tenotomy, may be found necessary. As the child lies in bed, the weight of the clothes should be fended from the toes by a cradle.

PSEUDO-HYPERTROPHIC MUSCULAR PARALYSIS.

The adjoining figure (Fig. 16), taken from a patient at the Children's Hospital, shows some of the characteristic features of this disease. The calves and buttocks are enlarged, and there is an arching of the loins. The hypertrophy is symmetrical.

Microscopic examination proves that the increased

size of the muscles is due to development in their substance of connective and adipose tissue, the muscular elements themselves being less plentiful than normal. These changes are associated with weakness; the boy (the subjects are generally boys) is perpetually falling about. When the disease

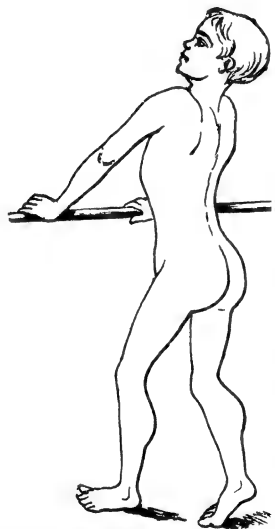


Fig. 16.—Pseudo-hypertrophic Paralysis; enlargement of deltoids, buttocks, and calves.

has advanced, the walk is peculiar; the child steps along like a bare-footed bather descending a shingly beach, and endeavours to preserve his balance by keeping the legs wide apart, and by throwing out the arms (Duchenne). The heels being drawn up, he walks much upon the toes. He cannot stand firm, but falls forwards; the shoulders are thrown back, in order to render the equilibrium more stable. Thus, arching of the loins is produced, but when he is in the recumbent posture this lordosis disappears. The weakness of the gluteal muscles renders the getting up from the floor a difficult task. The strange

gait, with weakness and unsteadiness, should direct attention to the muscles, even before hypertrophy has appeared.

Whether the muscular degeneration is the primary condition, or whether it is secondary to some pathological changes in the spinal cord, is not known. The treatment, however, may be directed to the muscles themselves, and should consist in massage and

galvanism. Possibly, in the early stage of the disease, these measures may be attended with some success.

Prognosis is unfavourable. The degenerative process may extend to the arms, and even to the muscles of the chest and abdomen. During this final stage there is a rapid decrease in the size of the hypertrophied muscles. Death occurs before adult age from sheer prostration, or from some intercurrent affection of the respiratory organs.

Tetany.—The chief feature of this peculiar disease is the muscular spasm, the flexors of the extremities being rigidly contracted. The disease may be dependent on rickets. "Attacks of tetany are frequently attributed by the public to teething, and on this view the doctor who is called in sometimes lances the gums; this had been done in the case of one of my patients without benefit. Seeing that in rickets dentition is always more or less interfered with, is it not more reasonable to refer the phenomena of tetany to the rickety condition itself, rather than to an outcome of this?"* Sometimes the hands and feet alone are affected. "The thumb is adducted, but the terminal phalanx is not flexed, thus differing from the position in the ordinary convulsions of children." The first joint of the fingers is flexed, the other joints being extended. In the slightest form of the disease the thumb alone is affected; the sole is arched, and the toes are flexed. Opisthotonos and trismus are rare complications. The rigidity of the muscles persists during sleep, nor is it affected by the administration of chloroform; these facts may be considered as evidence of the spinal origin of the disease. Complete intermissions in the rigidity are rare. Both hands, or both feet are affected at the same time, and even during the spasm there is no elevation of temperature.

* "Tetany in Young Children." Abercrombie, 1880.

The feet being affected, the ankles are straightened out and the toes curled up.

Laryngismus stridulus (page 36) is spoken of as a constant symptom of tetany, as is also irritability of the facial nerve; passing the finger over the nerve trunk sufficing to cause contraction of the sphincter fibres of lips or eyelids. The disease has a tendency to relapse; mild cases get well spontaneously.

Any severe disturbance such as that arising from wet or cold, or the irritation set up by improper food, may cause the carpo-pedal contractions in an unhealthy little child.

Treatment.—Attention must be paid to diet; the rickets must be treated (page 72); diarrhoea checked (perhaps by the administration of castor oil), and tonics of oil and iron prescribed in due course. Bromide of potassium may be needed. Fresh air and warm clothing are of the utmost value.

Spastic paralysis, or tetanoid paraplegia, as Ranney and others call it, is a somewhat common form of paralysis in children. It is the result of a symmetrical sclerosis of the lateral columns of the cord. There is no loss of sensation, for the sensory part of the cord remains sound. All the reflexes are exaggerated, for although the reflex loop is entire, the cerebral control is no longer able to be sent through the diseased motor track of the cord. So exaggerated are the reflexes that, on approaching the child for the purpose of examination, the limbs may become rigidly flexed, or drawn together with spasmodic violence. On attempting to walk, the limbs become stiffened, and the heels are drawn up, because the muscles, free from control, overact their part, and the toes are made to scrape along the floor.

There is no wasting of the muscles at first, unless the anterior cornua of the grey matter be also implicated; but in due course the muscles become stiff and

contracted, the feet are deformed, as shown in Fig. 17, the fingers "clawed," and the poor child is bed-ridden, and a hopeless cripple. Hopeless, I say,



Fig. 17.—Spastic Paralysis The child could not sit or stand.

because surgery can do little for these cases ; massage gives no result, and tenotomy is disappointing. The disease is often associated with fits, or with imbecility.

Case.—A child of ten years was in the Louise

ward with hips and knees permanently and rigidly flexed, the left knee showing a considerable amount of three-fold displacement of the tibia; the left foot was everted, and the toes were stiff. The thighs were so firmly adducted that a pad had to be wedged between the knees to prevent ulceration. The application of stirrup and weight effected no improvement; but the feet began to swell directly after its adoption. To touch the surface of the body was to send the tensor fasciæ femoris into spasmodic contraction. The child complained of general pains. The administration of chloroform was of no benefit, nor was a gentle straightening of various joints under its influence; indeed, no treatment was found of avail.

Neuro-mimetic (hysterical) affection of the spine, hip, or other joint or tissue, is met with occasionally, even in early childhood, and in either sex. Some of the signs of joint disease are closely imitated, but, as a rule, there is no wasting of the muscles of the limb—an early sign of joint disease. The child believes that he cannot move the limb, and usually keeps the joints partially flexed. There is no redness or heat of the surface, nor any swelling. Sometimes it is a difficult matter to say whether there is incipient disease or not, and if in doubt, it is advisable to keep the child at rest, and the part under close supervision before expressing a decided opinion.

Diagnosis.—If the child's attention be directed to the "painful" part, and the skin be even lightly touched, he will be apt to wince; but if attention be drawn away, as in the earnest examination of a distant part (of the chest wall, for instance), the fingers of the other hand may be thrust into the tissues which were previously so "tender," without the least discomfort. Neuro-mimesis invariably overacts its part, or the correct diagnosis might more often escape recognition. Sometimes the child may afford clear

evidence of nervous or physical weakness; in some cases it is not improbable that blame may be ascribed to educational over-pressure. Generally, the chief part of the pain and tenderness is located in the skin.

Trismus nascentium is a rare disease in Great Britain. It generally comes on from the fifth to the tenth day after birth, and is popularly called "nine-day fits." It is more than possible that the tetanus is the result of the inoculation of a specific bacillus by unclean hands or scissors.

Following the lead of Marion Sims, Hartigan ascribes the disease to extravasation at the base of the brain and medulla, the result of inward displacement of the occipital bone; there being in most cases a definite overlapping of the lateral margins of that bone by the posterior border of one or both parietals.

As regards drugs, castor oil, opium in the most minute doses, and bromide of potassium, might be employed, and chloroform might be administered if the tetanic convulsions be severe.

Prognosis is exceedingly grave; but Hartigan affirms that if midwives be taught the expediency of keeping the infant from assuming the supine position, so that the occiput be kept always free from pressure, the result of treatment is promising. He goes so far as to suggest that if the displacement of the occiput cannot be corrected by postural treatment, the bone should be elevated by definite though simple operative interference.

Neuralgic pains are apt to occur in the mammae of girls approaching puberty. They should excite no alarm, being almost physiological in their nature. They may be relieved by belladonna liniment, or by friction with oil. Laxative iron mixture may be prescribed, or some other tonic.

Sporadic cretinism is the myxœdema of childhood, and before making any remarks upon the

pathology of the disease, I may as well briefly record a case which was recently under my care :—

The child, aged five years and a half, had been born in the Hampstead district, of healthy parents. She looked about three or four years younger than her actual age. She had been weaned at three years, but was still fed from the bottle. Amongst the chief clinical features were the large mouth and protruding tongue, and the *absence of all trace of thyroid gland*, the presence of diffuse tumours over the sub-clavian triangles ; the limbs were large and rounded. The child could not walk or stand ; neither could she speak.

The characteristic deposits in the neck, as also those which shrouded the muscles of, and thickened the limbs, were the result of mucoid infiltration of the subcutaneous tissue, and were not of the nature of fat.

Reference may be made to a valuable paper which was contributed nearly forty years ago by Mr. Curling on two similar cases, in which he suggested that the physical and intellectual defects in these children were probably due to the absence of the thyroid gland depriving the economy of certain assimilation-processes ; also to the work of Kocher, Ord, and Horsley upon the subject of cretinism. Mr. Horsley's vivisection experiments upon monkeys have amply shown that the removal of the entire gland of the adult is likely to be followed by progressive myxœdema.

According to Mr. Horsley, one probable function of the thyroid gland is the control of the mucinoid substances in the tissues of the body. So far as the surgery of childhood is concerned, there are two forms of disease resulting from atrophy of the thyroid, namely, intra-uterine cretinism, to which I have already alluded under the heading, **Fœtal rickets** (page 72), and sporadic cretinism, in which there is early extra-uterine loss of the gland.

CHAPTER XIII.

CERTAIN MALFORMATIONS IN HEAD AND NECK.

Chronic hydrocephalus is a collection of fluid within the cerebral ventricles, the brain substance being expanded and thinned. The fluid may increase so as to cause separation of the cranial bones, and to leave the sutures closed only by a wide membranous film, the brain substance being represented by a cyst-like layer of nerve tissue spread inside the capacious cranial cavity. The excess of fluid may be the result of a slow inflammation of the arachnoid, and of the lining of the lateral ventricles, which may have existed during foetal life, or of a blocking of the cerebro-spinal opening. The arachnitis may be of syphilitic origin. The face is small and old-looking and the forehead and head are excessively large (Fig. 18). The child has no physical or intellectual vigour and probably falls an early victim to convulsions or pulmonary disease.



Fig. 18.—Chronic Hydrocephalus, drawn from life.

Treatment.—Nothing effectual can be done for the child, but some slight elastic compression may be applied and tonics may be administered. There will be imperfect innervation, and the child may gradually sink. Repeated tapping of the ventricles has met with little success. If compression be employed, strips of Leslie's soap plaister may be used, about half an inch wide, and long enough to reach from each mastoid process across the vertex to the opposite orbit and crossed obliquely; other strips are to be fixed across from one temporal region to the other, and a

long strip is carried around the base of the skull. But whether this treatment be adopted, or that by an elastic band, careful look-out must be kept for compression symptoms. In one case the ethmoid bone was disarticulated by the fluid pressure, and death supervened. The intracranial pressure which is ordinarily associated with hydrocephalus is likely to determine cranio-tabes (pages 69 and 81), or even general honey-combing of the skull.

Acute hydrocephalus is the result of tubercular inflammation of the membranes of the brain (page 66). The surgeon meets with it chiefly as a final complication of strumous disease of bone or joint (page 270).

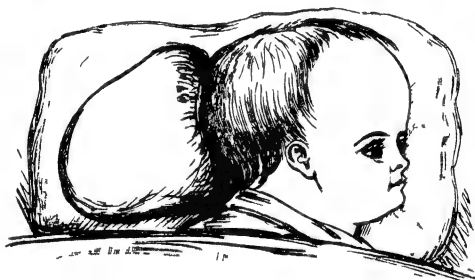


Fig 19.—Occipital Encephalocele

Meningocele is the protrusion of some part of the membranes of the brain through a gap in the skull, the result of imperfect ossification; it may be caused by hydrocephalus during intra-uterine life. The usual situation of the tumour is at the occiput (Fig. 19), the root of nose (Fig. 20), the inner angle of orbit, or the parietal region. If the deficiency existed at the spheno-ethmoidal region, there might be a prolapse into the pharynx or nasal fossa. From the dragging of the tumour during the progress of ossification, the

interior of an occipital meningocele may become at last completely cut off from the cavity of the cranium.

Encephalocele is a tumour of like nature to the preceding, but with the addition of some of the cerebral substance. Fluid may intervene between the protruding brain substance and the membranes, the condition being termed hydro-encephalo-meningocele. But the fluid is usually contained within the distended cerebral ventricles. A favourite situation of the protrusion is the occipital region, where the gap may allow of the escape of much of the cerebral hemispheres. The condition is generally associated with internal hydrocephalus, and some portion of the lateral ventricles, distended with fluid, may be extruded in the cerebral substance. If the tumour be translucent it probably consists of dura mater with cerebro-spinal fluid only (Fig. 19).

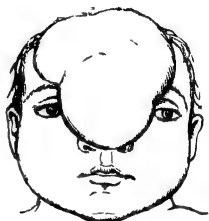


Fig. 20.—Anterior Meningocele.

The diagnosis may be for a time doubtful, but the surgeon should pause before interfering with a tumour of suspicious nature over or near to a cranial suture. A meningocele at the root of the nose (Fig. 20) might be mistaken for a cystic tumour (page 132) or a nævus. The situation of the tumour over a suture, the wide and deep connections of its base, the history, the strange appearance, and the absence of skin-staining would help in the differentiation. Nevertheless, the diagnosis from nævus is not always easy, and time may be required to make it absolute; exploratory puncture should not be adopted. The meningocele is a congenital growth, and must occupy a definite site; it has not the spongy feel of

nævus, though, like a nævus, it may swell when the child cries.

The diagnosis between one of these protrusions and a blood-tumour of the scalp will be helped by the situation of the swelling; the cephalhæmatoma is usually over the middle of the parietal bone, where a meningocele would be unlikely to be found. Compression of a blood-tumour would not give rise to convulsions or other cerebral disturbance; a meningocele is congenital, and some of its fluid can be squeezed into the cranium. Hydrocephalus would suggest intracranial connections of the tumour.

Treatment.—The tumour may steadily decrease, and ossification block up the abnormal opening. If the growth be pedunculated, the weight may cause a gradual elongation and narrowing of the pedicle and ultimate separation from the cranial cavity. In some cases the tumour, continuing to grow, at last gives way, either from a sloughing of the thin integument, or from accidental violence; fatal convulsions may be the result, but in rare cases obliteration of the tumour has thus been happily established.

If from the size and opacity of the tumour it were suspected that some cerebral tissue were in the cyst, no treatment would be advisable. Nor should active measures be undertaken if the tumour be associated with hydrocephalus or spina bifida.

Pressure, applied by means of an elastic band, might help to squeeze the contents of the cyst into the cranial cavity. The mere withdrawal of some of the fluid may give rise to convulsions and death.

If the tumour be translucent, unassociated with hydrocephalus, and in communication with the interior of the skull by a seemingly small gap, it might be expedient to treat it after the manner of a simple spina bifida; or if its pedicle were slender and appeared solid, it might be removed by the knife or ligature.

Noble Smith has reported the case of an infant whose occipital meningocele he had cured by repeated injections of Morton's iodo-glycerine solution (page 246), in eight-minim doses. The injection was passed deeply into the wall of the sac (not into its cavity), the object being to influence the cyst-wall, especially towards its inner lining.

Malformations of the external ear.—The pinna is not an important part of the organ of hearing, and in certain instances both it and the external meatus fail to be developed; or the pinna may be present and the meatus absent. The meatus may be completely or partially blocked by a septum of false membrane. Sometimes the pinna is found curled upon itself or crumpled over the proper site of the meatus. It is doubtful if an attempt to open up a meatus by dissection is likely to be successful, as the existence of a meatus beneath a rudimentary pinna is problematical. Occasionally one sees the pinna elongated and pointed in an extremely suggestive manner.

If the pinna be directed forward so as to stand out from the side, and give promise of future unsightliness, it may be flattened against the side of the head by a fold of soft wool and a bandage or strapping.

Instances of **supernumerary auricles** are on record; like the **pendulous growths**, they are occasionally seen in the neighbourhood of the ear (Fig. 23). They should be removed during infancy. Occasionally they are found along the front of the neck; their formation is due to a certain redundancy of tissue left after the closure of the visceral clefts. (See *Lancet*, February 18th, 1888.)

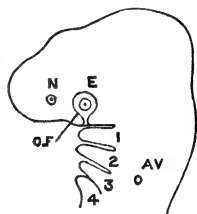


Fig. 20A.

1 to 4, Clefts and arches; AV, auditory vesicle; N, nasal pit; E, optic vesicle; OF, orbital fissure.

Development.—The lower part of the face and the upper part of the neck are originally mapped out in four processes, the visceral arches. From the highest of these the lower jaw is built up. Clefts are placed between the arches; they extend through into the pharynx. From the highest of them the Eustachian tube and the tympanum are developed; the lower clefts, which represent branchial apertures of aquatic animals, undergo obliteration. The auricle is formed from integument behind the external meatus.

Branchial fistulæ.—Small congenital apertures may be met with, extending towards the pharynx or œsophagus, from one or both sides. Often they are just above the sterno-clavicular articulation or along the front of the sterno-mastoid. Clear mucus may exude from them. They are remnants of the visceral clefts, and may generally be effaced by a cautery needle.

Branchial cysts of the neck are due to imperfect closure of the visceral clefts. The cysts result from a proliferation of the epithelial elements of the undeveloped tract, and may be found near the pharynx. They are round, ovoid, and smooth, and may contain mucus, atheromatous material, or blood. Should a cyst become distended with a fluid which, when drawn off by aspiration, is found pale or amber-coloured, the condition might be called **hydrocele of the neck**. (See also congenital cystic hygroma, page 128.) In the young child the cyst may not attract notice, but at any period its epithelial lining may be aroused into activity, when the cyst will become distended by fluid.

Treatment.—If aspiration and the injection of tincture of iodine fail, and if the cyst continue to grow, drainage with antiseptic precautions may be adopted, or an attempt made to remove the cyst wall by dissection; but in proposing this, the possibility of

the existence of deep and important connections must be anticipated.

Tracheocele.—From imperfect development of the trachea, hernial protrusions of its lining membrane may extend laterally into the neck. The tumours thus arising contain air, and are resonant on percussion. They do not lend themselves to active treatment.

Wry neck or torticollis is due to contraction of the sterno-mastoid; but neighbouring muscles become associated in keeping up the deformity, these other muscles being atrophied from want of exercise.

Causation.—The cause of the contraction may be a partial tearing of the muscular fibres during labour; irritation set up by spinal caries (page 252); inflammation of cervical vertebræ from wet or cold; glandular inflammation or suppuration; central irritation of the brain or spinal cord, and contraction of cicatrix after burn.

Congenital wry neck.—The **pathology** of the congenital form of wry neck is thus explained:—During the birth of the foetus, either from the force of the expulsive efforts, or from the traction exerted by the medical attendant or midwife upon the feet, the sterno-mastoid is partially ruptured within its sheath, blood being extravasated between the torn ends. But one may find tumour in the course of the muscle in infants whose entrance into the world has been so easy that neither nurse nor midwife had the opportunity of assisting; the rupture probably occurs from a twist of the neck, rather than from over-extension.

In the short and fat-necked infant, the tumour resulting from extravasation of blood may pass unnoticed for days or weeks; as the neck grows, the swelling attracts attention. The tumour may exist in the sternal or the clavicular part of the muscle, or above the junction of the two parts. The lump is tender

for a while, but as it becomes more consolidated the infant suffers no pain on its being fingered. It may be of the size and shape of an almond, filbert, or small walnut, its long axis being in the line of the muscle. In order to keep the swelling free from pressure, and to slacken the muscular sheath, the infant holds the head persistently drawn down towards that shoulder, and the subsequent contraction of the cicatrix produces a permanent deviation.

These sterno-mastoid tumours were formerly taken as a manifestation of constitutional syphilis. Dr. Fredk. Taylor has examined one of them *post mortem* (the child happened to be the subject of the congenital taint), and found in it fibrous tissue and shreds of striated muscle, the former being probably organised blood clot (Trans. Path. Soc., vol. xxvi.).

Having long been of opinion that these tumours were associated with the causation of wry neck, I at last met with a youth whose birth had been "cross-wise;" in whose neck a tumour had been noticed directly after birth, and who, it was stated, had all his life kept his head drawn down to the shoulder of the side on which the lump had existed during childhood.

The **appearance** of the child with wry neck is characteristic:—The occiput is drawn down towards the acromion process, and chin and face are directed towards the opposite shoulder. The shoulder of the affected side is raised, and that side of the neck is short and concave, the hollow being bridged across by the prominent muscle. From the constant dragging upon that side of the face, the commissures of the mouth and eyelids are drawn down; and the bones, especially the inferior maxilla, are imperfectly developed on that side.

The **treatment of congenital wry neck** varies with the age of the patient. In an infant,

as soon as the tenderness has passed away, gentle frictions may be made along the course of the muscle, and the shoulder being depressed, the head may be encouraged towards the straight line, and even beyond it. This is the prophylactic treatment of wry neck, and it will usually be found to suffice for removing all deformity if carried out with patience. No special treatment will be required for the tumour, though frictions may expedite its disappearance; no apparatus is needed.

Tenotomy.—If the child be older, and other treatment prove insufficient, it may be advisable to divide one or both heads of the sterno-mastoid half an inch above the clavicle, where the band or bands can be clearly felt beneath the skin.

The child should be anæsthetised, and placed upon a table (or on a low chest of drawers) in a good light. The side of the neck should be cleansed, and the course of the more prominent band of muscle made even more definite by the head being drawn up. A narrow-bladed knife with a sharp point is passed through the skin, quite close beneath the fibrous band, and on this being withdrawn, a blunt-ended blade is introduced, and the section effected. It is not advisable to divide the band with the sharp-pointed blade lest adjacent vessels be wounded.

A pad of dry lint is secured over the punctured wound, the head being left in the old position. If the other slip of the muscle require division, a second skin puncture should be made, as in the endeavour to reach that band from the original puncture a large vein might be wounded.

After-treatment.—When the skin wound has soundly healed, gentle massage must be begun, and fibrous bands, which now assert themselves, must be worked at with the thumb until they yield; they will not require division. The child should be made to

sit on a footstool, whilst the surgeon takes the head between his knees, and gently, but firmly, works at the neck. This he should do once or twice a day, and the nurse should be taught to practise the same manipulations. At frequent intervals during the day the child should be made to walk with a weight hanging down in the hand of the affected side, whilst at the same time he inclines the head towards the opposite side. At night he should lie with the affected side of the head resting upon a firm pillow of a proper thickness, so as to keep up a constant though slight strain upon all shortened bands.

With equal confidence and satisfaction I venture to affirm that by the adoption of these measures no mechanical apparatus is needed for the cure. The hands of the surgeon and the nurse, and the voluntary exercises of the patient, may accomplish all that screws, irons, and straps can do, and, moreover, with greater satisfaction and comfort.

Risks of the operation.—The operation of tenotomy of the sterno-mastoid is not without risk, and should not be undertaken in early childhood until the gentler treatment has had fair trial. One danger is from the blade transfixing some tributary of the subclavian vein at the root of the neck. Such veins may generally be avoided by keeping the knife close under the tendon. If, notwithstanding this precaution, much blood well up through the skin wound, the operation should be desisted from, and a thick pad of lint firmly pressed over the wound, with many turns of a soft roller passed round by the arm-pits. After an interval of a week or two the operation may be completed, this time through a different skin wound, or the open method may be adopted.

Another danger is that of air passing into the venous circulation through a wounded vein; for if air be carried into the right side of the heart, and

churned up with the blood, alarming syncope may occur. The veins are close to the skin on the one side, and to the large subclavian trunk on the other, and the accidental wound is stretched widely open by the strained position necessary for convenient section of the muscle. The accident has happened in my own practice; fortunately the collapse did not end fatally. The subclavian vein itself is hardly likely to be punctured if the knife be kept close against the band to be divided. The subclavian artery is well below the course of the knife. Tenotomy should not be performed by introducing the knife between the skin and the muscle, but I should have no objection to incising the skin and the muscle, in a deliberate manner, from before backwards. Indeed, by operating in that manner grave risks are obviated though a larger scar perhaps results. Modern improvements in surgical detail have rendered subcutaneous operations almost superfluous.

Caries of the cervical vertebræ may cause wry neck. The diagnosis may escape recognition, perchance, in the earlier days, the disease for which it is taken being generally rheumatism. (*See* page 254.) The first symptoms will be neuralgia in the area of distribution of the occipital nerves, in the neck, front of chest, shoulders, or arms. The scalp-pains the child is apt to call "headache." Children are not clever at describing pain, but they may be trusted when they affirm that a part "aches," or is "sore." When wry neck is associated with obscure pains in the regions indicated above, and is increased by steady pressure upon the head; when the child sits with his chin supported on his hands, and, on being told to turn his head, wheels his whole body round, and refuses to shake or nod his head, there can be no doubt about the deformity being caused by vertebral disease.

Stiff neck.—A girl has been under treatment for a sudden deviation of the neck due to inflammation of the cervical tissues generally, after her wearing a hat which was sopping wet. Probably the inflammation was greater in the tissues on one side of the neck than on the other, as a single sterno-mastoid was contracted. Pressure on the head and upon the spinous processes gave distress. After four days in bed, the head being steadied between sand-bags, and with the use of fomentations under oil-silk, the child became convalescent. Stiff neck from cold is often of this nature, though in a less marked degree. It is best treated by rest and warmth.

When a lymphatic gland is acutely inflamed beneath the deep fascia, the pressure is taken off from it by persistent contraction of the sterno-mastoid of that side, the torticollis disappearing on the subsidence of the inflammation. So also with deep cervical abscess.

Stiff neck may persist after convalescence from mumps. These cases are best treated by massage and education, as suggested on page 183, and by iron tonics. I have met with wry neck in a boy in whom the deviation was the result merely of habit. With judicious supervision he was soon cured.

The occurrence of contraction from the irritation of intestinal worms or teething is possible. The rigidity would be induced through the cerebro-spinal system, acting through the spinal accessory nerve, or through a cervical nerve supplying the sterno-mastoid. I never met with a case of this sort.

Hysterical torticollis is not common. Complaints of pain and suffering will probably be described in exaggerated terms, certain symptoms being but imperfectly imitated. The patient would most likely experience great distress on the *skin* of the neck being gently pinched!

Congenital asymmetry may affect the head and face, as it may the trunk or limbs. The disparity of the two sides is not likely to be diminished in the subsequent growth of the child, nor is the disfigurement capable of improvement by surgical interference.

CHAPTER XIV.

THE MOUTH, PHARYNX, NOSE, AND EAR.

Development.—The first that is seen of the buccal cavity is a wide cleft beneath the fronto-nasal process; laterally it is bounded by the maxillary processes, and below it the mandibular plates are advancing towards the middle line.

As shown in Fig. 21, the fronto-nasal and the maxillary processes are at this time separated by a fissure, which extends from either side of the mouth into the orbit.

Atresia oris.—At birth the mouth has in rare instances been found completely closed. The treatment is to bring a flap of the mucous membrane over the freshly-cut lip surface, and there fix it by fine sutures. Cooper Forster has described a case in which the mouth was found so small as only to admit a full-sized bougie. To this deformity the term **microstoma congenitum** has been given. To diminish the risk of closure by cicatrization after operation, the

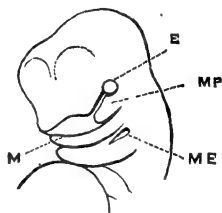


Fig. 21.—Development of Face.

E, Orbit; MP, maxillary process; M, inferior maxilla; ME, cleft for external auditory meatus.

mucous membrane should be drawn well over the raw surface and carefully sutured to the skin—raw edge to raw edge. Constant dilatation may be required to maintain the size of the opening.



Fig. 22.—Cicatricial Contraction of Mouth.

The small mouth is not necessarily a congenital defect; it may be caused by the puckering and contraction which follow in the healing of syphilitic ulcerations (Fig. 22), or after the healing of a severe burn.

The child being in a good state of health, a plastic operation on the principle described above may be undertaken.

Macrostoma congenitum is the opposite condition to that last mentioned, the corners of the mouth being extended through the cheek, and towards the angle of the jaw. The defect may be traced to arrest of union between the maxillary process and the first branchial arch (Fig. 23*); it is likely to be associated with imperfect growth of the lower jaw. (See Fig. 21.)

Errors of development in connection with the branchial arches are said to be more frequently met with in girls than in boys; hare-lip, on the other hand, is more often seen in boys.

If the **orbital fissure** (Fig. 21) be not obliterated by the fusion of the fronto-nasal and maxillary processes, the mouth will be extended towards the eyelids.



Fig. 23 — Large Mouth; pendulous growths near ear (See also page 179.)

* After J. H. Morgan; Trans. Med.-Chir. Soc., vol. lxxv.

Ranula is a cystic tumour in the sublingual region. It causes a bluish and translucent bulging of the mucous membrane; it is quite soft. It has ordinarily no direct association with the salivary gland or its duct, but is merely an increasing collection of mucus pent up in one of the follicular glands of the floor of the mouth. The glairy fluid which escapes on puncture of the cyst is mucus, not saliva. The blocking of the duct may be the result of inflammation, or of the impaction of a concretion.

Simple puncture of the cyst rarely suffices for its permanent obliteration; nor does it always answer to snip out a piece of the cyst wall; for the cyst being emptied, the edges of the wound fall together and adhere, and before the fluid again begins to distend the sac, the cicatrix is strong enough to bear the strain of the increasing contents. The most prominent part of the swelling may be transfixed by a hook tenaculum, and that part of the cyst wall which is thus raised may be cut off by the scissors, placed beneath the convex part of the tenaculum. If the cyst again fill, a large silk seton may be passed through it for a few days; unless the seton be thoroughly well knotted, the movements of the tongue and of the floor of the mouth will untie it. It may even be necessary in dealing with this often troublesome affection to daub the inside of the cyst with a very strong carbolic lotion. Cystic hygroma (pages 128 and 190) may bear a close resemblance to ranula.

Atheromatous cysts may occur in this region. They are rounded and not lobulated. When the gruelly nature of their contents is discovered, they had better be removed by careful dissection.

Abscess in the floor of the mouth may be mistaken for ranula, unless the inflammation associated with it be acute, in which case the redness, pain, and thickening suffice for the differentiation.

Outgrowths from the gum may be of the nature of granulation tissue or simple hypertrophy; they may be scraped off with the end of a director or sharp raspatory; an outgrowth of granulation tissue may be caused by a decayed tooth.

Congenital hypertrophy of the gum.—Physiological activity may be so great that by the fifth week after birth many teeth may have appeared, a pink mass of gum tissue protruding between the lips; from exposure its surface may become skin-like. Repeated partial operations may be required to remove the disfigurement, and portions of the alveolar process may have to be removed by saw or chisel, bleeding being checked by cauterisation. (Though the hypertrophy is called **congenital**, it may not appear until the first teeth are being cut. It may be associated with intellectual deficiency and with physical deformities of various kinds.)

Epulis, a sarcomatous outgrowth from the gum, is of somewhat common occurrence, especially on the lower jaw. The use of the gouge may effect its complete removal. If necessary, a tooth may be extracted, or even a piece of the alveolar process be removed. (See page 122.) Epulis is often a simple *fibrous outgrowth* without a trace of a sarcomatous admixture.

Congenital cystic hygroma in the floor of the mouth may be mistaken for ranula; indeed, it is often impossible to make at once a positive and correct diagnosis. [A further account is given on page 128.] The sublingual region is often invaded by the cystic growth, which may find its way amongst the muscles until it bulges in the submental or submaxillary region. The mass is painless, lobulated, and evidently composed of cysts of different sizes. Though the condition is generally met with in early childhood, it is not always what its name implies, congenital.

In one case the growth extended with great rapidity, the tongue being pushed up until mastication and deglutition were extremely difficult, saliva ran continuously from the mouth, and the child grew thin. The submaxillary and upper cervical region became invaded, and the condition looked desperate. Then the growth underwent spontaneous inflammation, subsiding without suppuration, until nothing remained of it but a local thickening. It would have been impossible to dissect out such a growth, for its attachment would be exceedingly deep. Hygroma in the floor of the mouth might easily be mistaken for a nævus; it looks blue through the mucous membrane, but it generally contains larger cysts than would be found in nævus.

The **treatment** need not be precipitate; progress should be watched. If it be growing, and threaten obstruction of the mouth, a seton may be passed through it, or prominent cysts punctured; inflammation caused by the seton might determine obliteration of the entire mass.

Nævus may affect the lips or mucous lining of the mouth, as a flat or rounded mass. If bruised by food or by the teeth, it is apt to bleed; sometimes bleeding is spontaneous; it had better be attacked with the thermo-cautery. During the operation the adjacent tissues should be protected from scorching by a fold of wet lint, and the heated tissue should be kept away from any neighbouring piece of membrane until it has cooled down.

Dentigerous cysts may be associated with error in the development of a tooth. The tooth is properly formed, but remains imprisoned in the depths of a serous tumour. These cysts are totally distinct in their origin and physiological meaning from those other tooth-bearing tumours which are found, some in the ovaries or testes, and others variously

distributed in the bodies of either sex. The cysts are rarely connected with the milk teeth, but in the case of a cyst containing a tooth of the permanent set, the corresponding milk tooth lingers long in its place. If, then, there be a fluid swelling in the jaw, and a milk tooth be found long after the time at which it is usual for it to be shed, considerable help is obtained for the diagnosis; a certain tooth, moreover, is conspicuously absent from the permanent set.

The cyst may be of the size of a marble, or even of a small egg; it may grow into the antrum and take its place, as it were. The bone is expanded, and occasionally the swelling is painful. The fingers readily perceive that the tumour is a central expansion of bone, and that it contains fluid; the bony walls yield to pressure, and then return to shape with crepitation, like the doubling of stiff parchment; on puncture, serum may be drawn off, and on a probe being introduced the missing tooth may be discovered.

Treatment.—A portion of the cyst must be excised, and the tooth extracted. Obliteration of the cyst might be accelerated by scraping and compression.

Lancing the gums is resorted to less frequently now that the diagnosis and treatment of children's diseases are better understood. Nevertheless, speculative incision into the tooth-bearing gum of an infant who suffers from constant fretfulness, diarrhœa, or convulsions, is occasionally resorted to; but to argue that, because the child improves after the operation, the lancet has afforded the relief, is illogical. Infants habitually recover from these conditions without the gum being lanced. Dentition is a physiological process, and probably the diarrhœa had no direct association with it. These infantile troubles generally appear when weaning is taking place, and are often due directly to irritation of the intestinal tract by unsuitable food.

A tense, swollen, and painful gum, over the cutting edge of an incisor tooth, must, after all, be exceptional; and it is somewhat strange that the child likes to have that same gum rubbed hard with the finger.

A proper dietary, the administration of rhubarb and soda, castor oil, or bromide of potassium, will often do away with supposed need of the gum lancet. Probably, in not a few cases in which the use of the lancet has been followed by immediate relief, the wound has been soundly healed again for weeks or months before the tooth has eventually appeared. If this be so, the argument is in favour of the relief being due to the local blood-letting rather than to any assistance given to the advancing tooth.

But if speculative incisions be made into the gums of a child who is fretful because he is ill, rather than because the eruption of the teeth is meeting with abnormal obstruction, serious trouble may follow. If the child be weakly, the loss of blood may suffice to extinguish his chance of existence; whilst if the blood-vessels be of impaired construction, or the blood thin and uncoagulable (*hæmophilia*), the bleeding may be arrested only after a period of much anxiety.

The wounds in the tissue of the gum may be slow to heal, or may be involved in suppuration. The infant may suck the wounded gum, and so keep up exhausting hæmorrhage.

Bleeding after tooth extraction, which may be dependent on the hæmorrhagic diathesis (page 58), may best be treated by plugging the alveolar cavity with a morsel of dry lint. If the bleeding have been serious the child should be constantly watched, lest oozing entail a fatal exhaustion. The thermo-cautery may, possibly, prove useful in checking the bleeding, but it should be used with caution.

Thrush; aphthæ (*ἄπτω*, fasten on).—Small curd-like patches are found upon the mucous

membrane in early infancy ; they may be the result of a "fastening on" of a fungus, the *oidium albicans*.

Beneath the flaky patch is an ulceration of the mucous membrane, and close around it is a hyperæmic ring. The flakes are of about the size of a pin's head ; they may be scattered or confluent. Fresh crops or patches may occur throughout a series of days or weeks. The infant is restless and disinclined to suck ; he may suffer from sickness and diarrhœa.

Treatment.—The mouth should be swabbed out after each meal with boracic acid and glycerine lotion. Borax with honey forms an agreeable and useful application to the patches. An occasional dose of rhubarb and soda will be required.

At first the fungus is easily detached, but when it has implicated the deep layers of the epithelium, it is not so manageable. Attention must be given to the infant's diet, and greater care paid, in the way of cleanliness, to the feeding-bottle (page 13), spoon, or cup.

Follicular stomatitis appears in the weakly child, especially after measles ; the treatment just described will be found to answer well.

Among school-children in France superficial sores and fissures may be met with at the angles of the mouth, which are caused by parasites conveyed by unclean drinking-vessels. The disease is called *perlèche* and is best treated by alum washes.

Ulcerative stomatitis occurs in children who have been badly fed and ill cared for. The mucous membrane is swollen, spongy, and dusky ; the inflammation may run on to ulceration or gangrene. The lining of the lips and cheek may be affected, the teeth dirty, and the breath offensive. The gums being destroyed the fangs are laid bare ; nutrition is so much interfered with that teeth may fall out, or

require extraction. If the disease advance further, the alveolar process may undergo partial necrosis. The disease is rarely dependent upon the abuse of mercury; but formerly, when that drug was given more freely, ulcerative stomatitis, shedding of teeth, and maxillary necrosis, were not seldom caused by it. Sometimes an attack of ulcerative stomatitis is the prelude to cancrum oris. (*See Plate I. Fig. 2.*)

(The subject of spongy gums is also alluded to on page 73.) Occasionally stomatitis is met with in children who have been brought up on a scurvy-diet, but who manifest no other direct evidence of that blood disease. Ulcerations may also be the result of syphilis, when other evidence of congenital taint will be obtainable (page 77).

Treatment.—The mouth must be frequently swabbed out with a mild lotion of carbolic acid or of boracic acid (grs. 5 ad ʒj); sloughs should be picked out, incrustations removed, and all carious teeth extracted. A dose of rhubarb and soda should be given, and afterwards quinine, iron, or cod-liver oil. Fresh milk, vegetables, fruit, and meat may be required; sweet-stuff should be forbidden. Wine may be needed.

Maxillary abscess and necrosis* result from acute dental periostitis and alveolar abscess. The cheek grows swollen and red, tender and hard. The jaw is fixed by inflammatory deposit, a red line appearing in the œdematous gum around a discoloured or hollow tooth; sometimes, on gently pressing the cheek, ill-smelling pus wells up between tooth and gum. The child will suffer intensely, and may neither eat nor sleep. If the disease be allowed to run its course, an abscess opens by the angle of the jaw, on the cheek, or chin. Later, a sequestrum may be discovered, especially when, as usually happens, the lower jaw is implicated.

* *Medical Press and Circular*, January 12th, 1881; p. 30.

Treatment.—The diseased tooth must be extracted. Yet it sometimes happens that a dental surgeon refuses to extract a condemned tooth because of the acuteness of the local disturbance; and he injudiciously advises delay until the inflammation shall have quieted down. But if only he can get the blades of his forceps upon the tooth he ought straightway to extract it, otherwise necrosis might extend and suffering be needlessly prolonged. Poppy-head fomentations and poulticings are out of place, but an elevator working from the outer side of the tooth affords prompt relief. If abscess have formed beneath the gum, and no individual tooth appear to be the cause of it, it will be well to incise the boggy tissue and to wait before extracting a tooth. In making the incision, the lancet or bistoury should be thrust very firmly into the very depths of the swelling, the child being under the influence of chloroform. Attempt to open the abscess should not degenerate into mere scarification, but the lancet should be thrust boldly down into the suspicious area.

In the removal of sequestra, the less the wounding of the skin, and the less the disturbance of the young teeth, the better. Whether a sequestrum be removed through the mouth, or by way of a sinus which opens near the angle of the jaw, must be determined by the nature of the case. Necrosis of the superior maxilla is rare, because its tissue is less dense than that of the lower jaw, and, therefore, better calculated to endure the effects of acute inflammation.

Both in the upper and lower jaw extensive necrosis may be caused by the local effects of the poison of some exanthematous fever. While the process of exfoliation is taking place, strength must be kept up by tonics; sanitas wash and spray must be used to correct the fœtor of the breath, and sequestra are to be removed as soon as possible.

Cancerum oris is an acute inflammatory affection of the cheek and lips, or even of the jaws; it rapidly runs on to ulceration and gangrene, and causes death of the child by exhaustion or blood-poisoning. It is not a common disease; and it selects victims from wretched children who have received but little attention in the most important matters relating to hygiene. It is specially apt to affect the child whose physical condition has been exhausted by measles or some such ailment. Fortunately it is not usually a painful disease.

The **pathology** of the disease remains obscure; but the belief that the attack depends upon prolonged mercurial treatment is not now so prevalent as it was a few generations back. Some affirm that it has association with micro-organisms in the blood.

Cancerum oris may begin as an innocent-looking swelling of the cheek or lip, the mucous membrane being the seat of a superficial ulceration; occasionally it follows some attack of ulcerative stomatitis (page 194). Or the mucous membrane may be greyish, and covered with a foul exudation. The swollen tissues are hard, and the skin is at first reddish. The breath is foetid, and there is profuse ptyalism. When the cheek is brawny and thick, the interior of the mouth cannot be inspected without causing distress. The ulceration extends rapidly; the gums become gangrenous, the adjacent teeth loosen and eventually drop out. Extensive necrosis of the alveolar process of the maxilla may result, and the pharynx may be laid open.

The phagedænic ulceration extends beneath the skin, so that between the floor of the ulcer and the skin there is a well-marked groove in which the destructive process is advancing most rapidly. The margin of the overhanging skin may be blue and gangrenous. In a case recently under my care the

noma had begun (after measles) in the parotid region, and had invaded the pinna of the ear and the cheek. In the floor of the ulcer the ramifications of the facial nerve were exposed.

The first indication for alarm may be a dusky or black spot, due to coagulation of blood in the distended capillaries, and partly, no doubt, to the escape of coloured corpuscles. Though the child may be unable to eat, or to drink even fluids, "it is not a rare thing to find patients in whom gangrene has committed the most extensive and frightful ravages, and for whom recovery is hopeless, who neither suffer pain nor have suffered it, who maintain a good appetite, and continue sensible and even cheerful" (Dr. Bristowe).

The **prognosis** is highly unfavourable. The child may succumb to rapid exhaustion, or, lingering awhile, may sink from diarrhoea, broncho-pneumonia, or other effects of blood-poisoning. Though he may struggle through the attack, he can hardly escape without permanent disfigurement.

The **treatment** should be commenced with a free dose of rhubarb and soda. Food must be administered at short and regular intervals, and if the child cannot swallow, he must be fed by a full-sized, flexible catheter introduced into the stomach through a nostril. (See page 52.) Nutrient enemata may be administered. Wine, peptonised beef, milk, eggs, and beef-tea, should constitute the chief elements of the diet. The medicines will be quinine, iron, mineral acids, and perhaps opium. The last-named must be cautiously administered if the child be already threatened with coma; but to ease pain and allay restlessness it should be given in small and repeated doses until the desired effect is produced.

The **local remedies** comprise the free application of strong nitric or carbolic acid, care being taken that the tissues be clean and dry to begin with, and

that the acid do not flow over healthy skin; the operation is performed under chloroform. Or the infected tissues may be effectually and precisely destroyed by the thermo-cautery at the utmost heat. This procedure would be preferable to that of excising the gangrenous tissue with the scalpel. In the case alluded to above, we surrounded the foul ulcer with a thick layer of vaseline, and covered its surface with carbolic acid crystals, carefully swabbing up the caustic fluid as the acid deliquesced. The crystals were also packed beneath the overhanging margin of the sore. The child was kept for some days under the influence of laudanum and suffered little. She recovered; but some facial paralysis resulted.

The mouth may be swabbed with weak disinfectant lotions, the interior of the cheek being smeared with a mixture of vaseline and eucalyptol, or boracic acid.

Tongue-tie is a common congenital defect, varying much in degree. Sometimes the pale muco-fibrous band is tight enough only to check extreme protrusion of the tongue; whilst at others the retraction is so complete that the tip of the tongue can hardly be brought beyond the level of the incisor teeth. In the latter case there would be impediment to sucking, the contraction demanding immediate treatment.

The **operation** is simple and almost painless. The infant's body and arms are steadied between the nurse's knees, the surgeon hooks the tips of the first and second fingers of the left hand under the tongue, one on either side of the frænum, and with a pair of scissors just snips the edge of the little cord; he tears through the rest of the frænum, and all is done. No anæsthetic is required, and no after-treatment. There is no hæmorrhage of importance, for the ranine artery, as it runs along the under surface of the tongue, is held up out of harm's way by the fingers. The snip

in the frænum should be just enough to start the subsequent tearing. If the incision be made too freely, or the tongue torn up from the floor of the mouth with unnecessary vigour, it may be so much loosened that the infant can suck it backwards, and even bring it within the grasp of the constrictors.

Tongue-swallowing is a troublesome condition: it may be necessary to have the child constantly watched, lest suffocation ensue. For the purpose of keeping the tongue in place, a plastic operation on the floor of the mouth, with the view of establishing sublingual adhesions, might be undertaken—in fact, producing an artificial tongue-tie. Tracheotomy might be demanded as a precautionary measure, as the condition is apt to cause fatal dyspnœa.

Thumb-sucking is a habit of which a child should be broken as quickly as possible, or else it may be persisted in for years. In early childhood the jaws are soft and pliable, and if the thumb be constantly pressed at the back of the intermaxillary bone, and, what is more, forcibly thrust against it in long-continued and energetic sucking, the alveolar process and the incisor teeth will be driven forwards, the palatine arch rendered high and narrow, and the inferior maxilla repressed.

Painting the thumb with aloes or other nauseous drugs, and even tying up the hands in thick gloves, may fail to prevent the child putting the thumb into the mouth; but the straight tubular arm-splint, applied around the elbow, will afford the needful mechanical hindrance.

Hypertrophy of the tongue; macroglossia, is a congenital disease; or, being slightly large at birth, the organ may soon afterwards take on growth. The tongue is too large for the mouth, and hangs out between the lips or over the chin. The mouth being thus kept open, saliva constantly trickles down, though

the tongue itself becomes dried from exposure. Where its surface comes in contact with the teeth, ulceration occurs. Macroglossia is said to occur most frequently among idiots ; certainly it is often found in the cretin (page 173). Barker, in an excellent account of macroglossia, gives numerous references. Out of one hundred and thirteen cases the enlargement was congenital in at least sixty. The tongue, being large, is constantly in the way of the teeth ; the hypertrophy might first be detected on the tongue being bitten ; its enlargement might then be ascribed to injury. Macroglossia may be associated with hypertrophy of the connective tissue in other parts of the body, especially the root of the neck, as referred to in connection with "sporadic cretinism."

Treatment.—If the tongue were so large as to protrude permanently from between the lips, compression by adhesive rubber plaster might be tried, or electrolysis. If more heroic measures were required, a V-shaped piece might be removed from its central part, the raw surfaces being brought together ; hæmorrhage being arrested by wire sutures, passed so as to include the bleeding vessels. If this failed, it might be necessary to excise the tongue ; thus local irritation would be removed, and due development of the maxilla and the eruption of the teeth ensured. But if the patient be idiotic, no operation should be advised.

Pathology.—The over-growth is due to congenital thickening of the lymphatic and connective tissue elements of the organ, the lymphatics being greatly dilated. The condition is thus allied to that of elephantiasis.

Macrochellia is an unsightly over-growth of the lips from the same cause. Occasionally the lip attains an enormous size.

Acute glossitis causes the tongue rapidly to swell ; the impressions of the teeth are found around

its sides and tip. If the condition be associated with extreme dyspnœa, incisions may be required along the dorsal aspect. Possibly, even tracheotomy might be demanded, especially if the swelling were accompanied with œdema of the mucous membrane about the epiglottis and larynx. The child would need constant watching. An astringent mouth-wash, and free purgation would be required. Ice might be sucked.

Simple ulceration of the tongue may be found near the frænum, from the tongue coming in frequent and violent contact with the sharp edge of the lower central incisor teeth, during an attack of whooping cough. It is more apt to occur in little children, in whom the edge of those teeth is still serrated. The treatment should be directed chiefly to the relief of the spasmodic cough, jagged teeth being attended to or removed.

Abscess in the substance of the tongue generally comes on quietly. Its exact nature might escape recognition at first. Then it would become evident that in the depth of the soft lingual tissues was a cyst-like swelling. Puncture clears the diagnosis, and dissipates the trouble.

Cysts in the tongue, if superficial, are easily diagnosed; if more deeply placed, puncture would establish their identity. Cysts may also occur in the substance of the lip. Dermoid cysts occurring between the genio-hyo-glossi may be associated with the (developmental) lingual duct described by His.

Nævus of the tongue is generally associated with growth of vascular tissue about the floor of the mouth or cheek. But when it affects the tongue alone, there is no difficulty in recognising its nature, unless the invasion be altogether beneath the mucous membrane.

If the nævus be bitten, serious bleeding is apt to occur. It had, therefore, better be dealt with promptly by the cautery; or, if thought expedient, a

V-shaped piece including the vascular infiltration may be excised, the edges of the wound being approximated by deep sutures.

Warts on the surface of the tongue had better be snipped off by curved scissors. The application of lunar caustic or other escharotic is not a satisfactory way of dealing with them.

Bite of tongue.—If the bite be superficial and without hæmorrhage, it may be left alone; but if the bleeding were to cause faintness or alarm, and did not cease on the application of ice or powdered alum, the vessel should be secured by a suture passed beneath it. Extensive wounds of the substance of the tongue should be treated with sutures, not so much with the idea of obtaining primary adhesion as of keeping the gap narrow for union by granulation.

Relaxed throat may be an association of chronic pharyngitis and tonsillitis, the result of cold, or of imperfect sanitation. If chronic ulceration of fauces persist after the breaking of follicular abscess, the sore may be touched with lunar caustic, or with the point of the thermo-cautery. Every case of follicular inflammation must for a time be regarded with suspicion and dealt with cautiously. Little spots sometimes run together to form false membrane, and so follicular pharyngitis may be the precursor of diphtheria. (See pages 16 and 31.)

Tonsillitis in relation to febrile attacks.

—A child is suffering from febrile disturbance with no distinctive symptoms; he complains, perhaps, of headache, and is obviously out of sorts. Unless an inspection of the throat be made, the probability is that the *malaise* may be called “febricula” (whatever that may be), or may be ascribed to teething. In every case of obscure illness the tonsils should be examined as a routine practice. They may be found red and swollen, even though no complaint have been

made of the throat. The attack may be associated with languor and loss of appetite, with vomiting, or even convulsions. The differential diagnosis is from diphtheria (page 31) ; judgment for a time may be held in suspense. Purgation and tonics may suffice, in the course of a day or two, to establish convalescence. If the tonsils be enlarged, it may be expedient to amputate them ere the child be again similarly attacked, for tonsillitis is a recurrent disease.

If *chronic ulceration* of tonsil be associated with hypertrophy, amputation is required, or the ulcerated surface may be shaved off with a blunt-pointed bistoury. If the ulcers be large and superficial they may be scraped out with a Volkmann's spoon. If the ulceration be complicated with enlargement of cervical glands, the need of the removal of the unhealthy tissue becomes urgent, but at the same time every attention must be paid to the general treatment of the child.

Acute tonsillitis (quinsy) is of rare occurrence in subjects under puberty. Its treatment involves the continuous application of moist warmth to the outside of the neck, and early puncture of the swollen tonsil by a guarded bistoury. If the child resisted operative interference, an anæsthetic would be required, the mouth being held open with a gag, and the tongue depressed. By thrusting the bistoury directly backwards into the enlarged mass, the internal carotid artery could not be injured ; it is secure on the outer and posterior aspect. Several punctures may be made in different parts of the gland. The general treatment would comprise free purgation ; and a mixture of iron and quinine ; an emetic may be of service ; salicylate of soda in repeated doses, and wine, might be given. The child should not be within the influence of ill-arranged drains, sinks, or closets. In a case of acute tonsillitis recently under treatment, we

evacuated a central abscess by thrusting a pair of dressing-forceps deeply into the swollen and friable mass. Thus the use of the bistoury was entirely dispensed with. It is dangerous to leave a tonsillar abscess to spontaneous evacuation. (*See page 267.*)

Differential diagnosis.—Simple inflammation of the tonsil must be distinguished from that associated with scarlet fever. In the former condition, though the temperature may be several degrees above normal, there is no redness of the tongue. Perhaps, also, but one tonsil is affected. A careful watch must be kept in case of the patch becoming covered with diphtheritic exudation; this would be fixed to the mucous membrane (page 20). The throat should be frequently inspected, and if there were doubt, the child should be isolated (page 31).

Hypertrophied tonsils. — The patient's face often wears a vacant and characteristic expression. The mouth is constantly open, on account of the air being unable to enter the lungs through the obstructed naso-pharyngeal cavity. Thus the face may become permanently elongated, and, from want of use, the nostrils fail to be developed. This condition is often a manifestation of the strumous diathesis; the enlargement is due to hyperplasia of the lymphadenoid tissue in the gland, and may be associated with lymphoid growths in the pharynx (page 210).

Breathing is harsh and noisy, and the voice thick and peculiar, the pharyngeal cavity no longer acting as a sounding-board. Deglutition is impeded, and when both tonsils are enlarged, only fluid food can pass the isthmus. An attack of catarrhal inflammation of the mucous membrane brings the masses into actual contact, rendering operation necessary. Sometimes the mucous membrane covering the mass is ulcerated, and the cervical lymphatic glands secondarily enlarged. When the tonsils are very large

inspiration is extremely laborious, and associated with a falling in of the walls of the chest; in this way pigeon-breast (page 101) may be produced. Sometimes the child wakes up at night in terror of impending suffocation.

Deafness is often associated with the hypertrophy, not from an actual blocking of the opening of the Eustachian tube, but rather from chronic thickening of the lining membrane which is continuous with that of the tonsil. The hearing may not be improved immediately after the removal of the tonsillar mass.

The **treatment** consists in the administration of cod-liver oil and iron; at the same time astringent gargles will be used, or the tonsils brushed with glycerine of tannin three times a day. This palliative treatment should be given a full and fair trial; it sometimes succeeds where little might have been expected from it.

The child should be put on a wholesome diet, and, if practicable, sent to a place where the air is fresh. He should be warmly dressed, but the neck need not be encircled in a woollen comforter.

Though the angle of the jaw marks the situation of the tonsil within, there is such a mass of intervening tissues that it is doubtful if the application of tincture of iodine, or any other drug, to the skin of that neighbourhood can be of therapeutic service; the parents, however, may derive comfort from the sight of a yellow stain upon the child's neck. Even if left to itself the enlargement often diminishes as puberty approaches, though it may not entirely disappear. But if the child be young, and the hypertrophy considerable, the medical attendant will scarcely be inclined to suggest non-interference on the chance of an ultimate, though distant, subsidence. The *indication for amputation* is the obstructed passage of air to the lungs, and of food to the stomach.

Operative treatment should be undertaken if after fair trial of general measures no equivalent improvement be manifest. If, when the child was first seen, the mass was hard, firm, and painless, but little direct improvement could be anticipated—still the trial should be given. In the case of sickly children, the operation may be delayed until the health has been improved by medicine and diet; but, generally, the sooner amputation is performed the sooner will convalescence be established, and annoying “throat attacks” cease to occur.

There is a wide-spread superstition against amputation of enlarged tonsils; parents are apprehensive

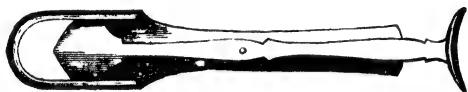


Fig. 24.—Tonsil Guillotine.

lest the voice should be spoilt thereby, or the sexual function impaired. The fear is groundless, and its origin is involved in obscurity.

Excision, or rather **amputation of the tonsil**, is not a very painful operation, but a timid child should not be submitted to it except under the influence of an anæsthetic. He should be sitting in a chair opposite a good light, his arms and chest being secured with a towel. When under the influence of the anæsthetic, the assistant who has been administering it can take charge of the gag and the tongue depressor, or help by thrusting his thumb firmly behind the angle of the jaw, so as to make the tonsil project still farther into the fauces, but this is rarely needful. The mass may be removed by either the guillotine, or with the straight, blunt-ended bistoury and vulsellum. If the guillotine be used, it should be the simple one here figured; the complicated

apparatus with spring and prong is not as trustworthy as ingenious. I prefer the bistoury and vulsellum, amputating first the right tonsil with my left hand, and then the left with my right hand. A piece of practical advice is to have two vulsella, one for each tonsil, for trouble and delay may be experienced in disengaging the teeth of the forceps from the amputated mass. If the operation be done without anæsthetic the loss of time which this freeing of the forceps involves is of importance, and especially so if there be much bleeding. Too little of the mass is apt to be removed unless the operator pull the tonsil well towards the middle of the fauces during the section; it is expedient to take away some of the gland which is hidden deeply behind the palato-glossus. The internal carotid artery is not in danger. The bistoury should be sharp, and should have a cutting edge to the end.

The throat may first be freely painted with a 10 per cent. solution of cucaïne; two applications should be thoroughly made with an interval of five minutes, and after a second five minutes the operation may be begun.

Other ways of dealing with the hypertrophied tonsils have been suggested, such as electrolysis, and puncture with the blade of the thermo-cautery. Of the former I have no experience, nor do I desire it. The igni-puncture I have once tried, but then I made a permanent passage through the tonsil of the calibre of a slate-pencil, and there it remained until, some months afterwards, the rigid mass was amputated.

After the return of consciousness the patient may suck ice, and be fed on an unirritating fluid diet. He should be kept indoors for a day or two. If serious hæmorrhage complicate the operation, a piece of lint dipped in an astringent must be kept pressed against the bleeding surface, an emetic may be advantageously administered, and if necessary the bleeding

surface may be touched with the thermo-cautery blade.

Re-growth of tonsil after efficient amputation rarely happens. If too small a slice of the mass be taken away, a second and more thorough operation will eventually be demanded.

Syphilitic ulceration from congenital disease is rare (*British Medical Journal*, Jan. 11, 1879).

Uvula.—If when the tonsils are hypertrophied the uvula be found long and œdematous, it is advisable to remove a portion of it at the time the tonsils are operated upon. A long uvula may, by keeping up a constant tickling about the back of the tongue, be the cause of spasmodic cough, and of vomiting. The state of the uvula should always be examined when a child suffers from a cough which is unassociated with thoracic symptoms. Such a cough may come on after drinking anything warm; or may be at its worst when the child lies down. Painting the throat with alum lotion may check the cough for a time, but the best treatment is amputation of the uvula by long scissors and toothed forceps. The scissors may have a crescentic notch in each cutting edge, so that the uvula cannot escape section. The uvula should be pulled well forwards before being cut; eucaïne may be used.

Post-pharyngeal abscess is considered in connection with spinal caries (page 267), to which condition it is generally due. It may, however, be the result of inflammation in the connective tissues at the front of the cervical vertebræ, and especially so after the occurrence of scarlet fever or diphtheria. But such an occurrence is extremely rare.

Tubercular disease of the naso-pharyngeal cavity is usually associated with other manifestations of the diathesis (page 60). The disease begins with swelling and suppuration in the follicular glands;

abscesses burst, and the mucous discharge becomes purulent, and even stained with blood. Ulcerations being formed, the surface of the membrane becomes honey-combed or excavated. Healing is associated with cicatrisation and contraction; thus the soft palate and other mucous folds may be dragged from their normal position and permanently fixed. The tonsils may also be implicated in the inflammatory process. (But such cicatrisation is more likely to follow on diphtheritic or syphilitic ulceration.)

The ulcers may have a steep or undermined margin, and a greyish, or bleeding floor. This condition of pharynx might be associated with inflammation of the middle ear, from extension along the Eustachian tube; or deafness may be caused by cicatricial contractions blocking the opening of the tube.

The **treatment** will be chiefly general (page 63), but if the ulcers be not hopelessly beyond the reach of practical surgery, they may be scraped clean, and subjected to insufflation of iodoform. The **prognosis** is extremely unfavourable.

Adenoid vegetations are of frequent occurrence in the naso-pharyngeal cavity. Often they are associated with enlargement of tonsils; they are the result of hypertrophy of the follicular glands. The child is the subject of naso-pharyngeal catarrh. He is pale and poor-looking; he cannot breathe through the naso-pharynx, so his mouth is always open, and his nostrils are small and flat. Like the subject of enlarged tonsils, he has a vacant expression and he snores at night. His voice is "nasal," and, on account of the blocking, or catarrh of the Eustachian tube, he is dull of hearing; sometimes he is quite deaf. If the vegetations have long existed, there may be serious deformity of the chest. And in a considerable proportion of children with serious nasal obstruction, hernia is co-existent (page 364).

The probable explanation of the condition is that it is an overgrowth of that tonsillar tissue which normally exists in the naso-pharyngeal cavity; and this accounts for its frequent association with enlarged tonsils.

Dr. Bronner states that in 200 children under his care for disease of the middle ear, over 100 had post-nasal growths.

In all children who suffer from recurrent or chronic disease of the middle ear, the naso-pharynx should be explored, and the growths, if present, should be removed.

By ocular and digital exploration of the naso-pharyngeal cavity, the diagnosis is established. The tonsil should, if enlarged, be dealt with first, and later on the vegetations should be removed with blunt-ended, curved scissors which are designed for the purpose; a sharp spoon and a ring knife may also be used. The operation is accompanied with much bleeding, and may require several repetitions. I have recently operated with the child's head hanging down, and thus the bleeding has given less trouble. I prefer to operate under an anæsthetic, though I know that some surgeons consider that it is not necessary to give it.

The **septum nasi** may deviate so much to one side as to cause serious obstruction of the nostril. By the use of a small pair of sequester forceps (the blades of which are enclosed in pieces of drainage tube, so that their grip may not damage the tissue) the septum must be deflected to the middle line, and even beyond it; and it should be bent over again from time to time as may be necessary. The nostril might be kept open by a piece of stiff drainage tube. If the septum were too large, a narrow triangular piece might be cut out of it by a tenotomy knife. Slight redundancy of the cartilage may be treated by an

instrument like the leather punch, by which small pieces may be taken out here and there. If any portion of the septum require ablation, the muco-perichondrium should be raised from it. Deviation must not be mistaken for abscess of the septum; a probe passed up reveals a corresponding depression on the opposite side of the septum. In one case the triangular cartilage protruded through a nostril to considerably below the level of the fleshy septum. Being denuded of its muco-perichondrium, the projection was cut off with scissors, and the tissues adjusted by fine sutures; the result was satisfactory.

Abscess of the septum is associated with local heat, pain, and fulness. The part throbs and is tender. A probe passed on to the other side of the septum shows that the fulness is not the result of a deviation of the cartilage. The pus is situated in and beneath the mucous membrane; a puncture with the lancet sets it free.

Epistaxis.—Bleeding from the nose is often a sign of constitutional weakness; a child who has suffered from it once is liable to recurrence of the trouble. Sometimes it is the ruddy child who is attacked, in which case the bleeding might possibly come as a relief to over-filled vessels in the head and neck. The hæmorrhage may occur after excitement in play, or without apparent cause, and, passing off, may leave the subject but little the worse for it. Often it is the result of injury. When the bleeding is associated with the hæmorrhagic diathesis (page 58), the effect may be very serious, if not fatal. The bleeding may be secondary to malignant polypus; or to an extensive ulceration, the result of struma or syphilis; or it may be caused by whooping-cough, or by disease of the heart, lung, or liver.

Treatment.—The child must be kept sitting or standing; if he become faint, the head should still be

slightly above the level of the rest of the body ; it is said that the arms should be raised above the head. He must not be allowed to disturb the formation of a coagulum by blowing the nose ; and for a while he should not be allowed even to breathe through the nose, the nostrils being firmly compressed by the finger and thumb. Long-continued pressure in this way may have an excellent effect, especially when, as is apt to be the case, the bleeding is from an ulcerated spot upon the septum.

The vaso-motor nerves may be stimulated to produce contraction of the arterioles by holding a cold stone, or large door-key, or a piece of ice to the nape of the neck ; cold water may be applied to the forehead and nose. The nostril may be irrigated with water as hot as can be borne ; after this, ice-cold water may be used. If in spite of these measures the hæmorrhage be continuous and alarming, the posterior and anterior nares must be firmly plugged with a piece of sponge which has been dipped in tincture of iron, and squeezed dry, or, better still, by strips of amadou.

Foreign bodies in the nostril.—Children are apt to push a button, bean, fruit-stone, or similar object, into the anterior nares. Subsequently, in an attempt to extract it, it may be thrust up to the level of the nasal bone. If it cannot be seen, the boy's statement of his exploit is apt to be disregarded ; but if a nostril have become suddenly blocked, there would be evidence of the statement being correct. After a time the nose becomes tender, the nostril begins to swell, and a muco-purulent discharge appears. Unilateral ozæna is unlikely to be of constitutional origin. Possibly a thorough inspection of the nostril can be obtained only on the administration of chloroform, and after preliminary syringing. On the introduction of a speculum the object may be seen and extracted. If the mucous membrane be much swollen, or the bean

be so far up that it cannot be seen, its presence may be determined by the use of the probe. Removal may be effected by a pair of slender-bladed forceps, or by a curette extemporised out of a hair-pin slightly bent at its closed end. If it can be seen or felt, it ought to be extracted in some way or another, as its continued presence would give rise to ulceration, and perhaps to necrosis. But if it were wedged high in the nostril, and resisted every attempt at extraction, it might be advisable to dislodge it into the pharynx. If, after the interference, the child can blow down that nostril, the obstruction has evidently been displaced.

Ozæna (ὄζειν, to smell).—An ill-smelling discharge from the nostrils may be the result of traumatic, syphilitic (page 77), or strumous (page 66) ulceration; or it may be caused by the irritation of a foreign body. In every case a complete examination should be made with speculum and probe, and, before using the former, the nostrils should be thoroughly cleansed. Frequent irrigations of warm water and sanitas, and insufflations of iodoform, will afford much relief in the former conditions, and the constitutional remedies will be of the utmost importance. *Chronic catarrh* may be treated on similar principles, and, in addition, an astringent powder may be blown up occasionally. In using the irrigator, the fluid thrown up one nostril should flow out by the other, the child breathing by the open mouth; the palato-pharyngei and the soft palate excluding the fluid from the gullet and mouth. Some time since, a case of so-called strumous ozæna and enlarged cervical glands was under observation, where the trouble was evidently caused by the irritation of sewer-gas. Four children in the family were affected. The source of the foul air was a wide opening in the main drain close by. As soon as any of the ailing children were sent into another part of the country all symptoms disappeared, whilst a relapse

occurred on the return home ; this happened on several occasions (page 104).

Sometimes an apparently innocent nasal discharge is of a diphtheritic nature, and is accompanied by albuminuria and followed by paralysis. (*See* chap. ii.)

Malignant disease of the nasal fossa is of rare occurrence. A case has recently been under supervision in which the new growth proceeded from the ethmoid bone, encroaching upwards upon the base of the brain, and extending downwards into the nasal fossæ. The growth was associated with frequent attacks of bleeding. It is only in the early days of the disease that operation can be expected to afford relief. (For meningocele of nasal fossa, *see* page 177.)

Mucous polypi should be treated by insufflation of finely-powdered alum and tannin, and, if necessary, by evulsion. Operation may be but partially successful, and may need repetition. Thickening of the mucous membrane over the inferior turbinated bone may be mistaken for polypus. But in the former condition the tumour is fixed, non-pedunculated, and usually of a bright red colour. The polypus is grey, stalked, movable, and perhaps seen with difficulty. The projection from the turbinated bone may require removal by scissors. Bernard Pitts tells of a case in which a nasal meningocele was unfortunately mistaken for a simple polypus. Mucous polypi are by no means common in childhood.

Impacted food.—Food which is being “bolted” may become impacted in the pharynx ; the child will choke, when probably the food will be ejected. But if it be so tightly wedged that no reflex act on the child’s part can cause its expulsion, a person of sense would thrust in the fingers and try to dislodge it. If, though the laryngeal aperture were not completely plugged, the accident were associated with

extreme dyspnœa, and the fingers passed beyond the epiglottis could not detect an impacted mass, a probang should be passed down into the stomach, as it is probable that the trachea is being compressed. The posterior part of the trachea is extremely compressible, and is easily thrust forwards.

Foreign bodies swallowed.—Parents may conclude that because a small object with which a child had been recently playing is lost to sight, it must have been swallowed. If a careful and thorough search be made of dress, bed, or carpet, anxiety may often be allayed by the discovery of the missing object. I was once called to a child who, as I was assured, had swallowed a large jet earring with a tassel fringe. He showed no symptoms of distress, and the earring was eventually discovered hanging to the mother's dress.

Foreign body in œsophagus.—If it be supposed that a foreign body is lodged in the œsophagus, that admirable instrument known as the chimney-sweep's brush should be used. It may be oiled and passed gently down to the stomach; then, by a little manipulation at the handle, a disk-like network of stiff bristles is made to stand out horizontally. In its ascent it closely sweeps the mucous membrane, and is almost certain to catch and withdraw anything lodged in the canal. A great advantage of this instrument is that, being very flexible, it is not likely to make a false passage. Cooper Forster tells of the end of a probang having been found in the posterior mediastinum! All instruments should be carefully inspected and tested before being used.

The abrasion made by a piece of bone in its descent may give rise to the sensation that the obstruction persists; the withdrawal of the open brush gives assurance to the contrary. Experience with œsophageal forceps and coin-catchers is not generally so satisfactory

as that with the chimney-sweeper's brush. If an *angular body* were tightly jammed in the œsophagus, *œsophagotomy* might be required.

For a **foreign body in the stomach**, porridge, pea-soup, or bread-and-milk should be given, after which an emetic may be administered. The surgeon should be ready at hand to perform tracheotomy, in case shifting the position of the body caused a blocking of the larynx. If not brought up with the vomit, no further trial of the method should be undertaken. The hope then would be that it might pass *per anum*. In the meanwhile the diet should be such as is calculated to form a full, pultaceous mass, in which the object might safely descend. Purgatives should not be given; it might even be advisable to delay the action of the bowel by small quantities of opium.

It is surprising how easily, in this way, comparatively large objects may pass through the ileo-cæcal valve and anus. I have known a very small button-hook, which was fortunately closed at the time, pass *per anum* without the least discomfort. The gastric juice has no solvent action upon coins and such-like bodies. The fæces should be carefully searched by breaking them up in a vessel with quantities of water, and then carefully pouring off the fluid part. Sooner or later the object will be discovered in the sediment at the bottom of the vessel. The child need not know of the continuance of the search, or of the anxiety.

Mumps is an infectious inflammation of the parotid gland; it is often epidemic, and one attack usually ensures immunity for the future. The sub-maxillary and sublingual glands may be affected as well as the parotid; the face is strangely broadened. The infective material is probably conveyed by the breath, and contagion may be spread even before the swelling of the gland has been manifested, and for an indefinite number of days, possibly for some weeks,

after its disappearance. If an outbreak occur in a school, many children may be attacked, even in spite of the prompt adoption of precautionary isolation ; but infants are rarely affected, even in a severe outbreak.

The period of *incubation* is two or three weeks ; the duration of the disease about two weeks more ; and, after that, the patient should be kept for at least two weeks out of the reach of those who are liable to be infected.

Pathology.—The inflammation may commence in the gland ducts, or in the connective tissue of the mass ; but infiltration of the whole of the substance of the gland soon takes place, and the fibrous tissue around it becomes implicated in the inflammation. Suppuration rarely occurs, and the serous exudation is in time completely absorbed. Hardness, however, may linger for a time, after all other symptoms have cleared away.

Symptoms.—The premonitory symptoms are general *malaise*, restlessness, headache, chilliness, and even vomiting ; after two or three days the swelling occurs. Subsidence may begin after three or four days. The swelling is attended with stiffness rather than pain ; the head and neck cannot be turned, mastication and deglutition are difficult, and the child does not care even to talk. The swelling, which is hard and elastic, begins in the hollow between the ramus of the jaw and the mastoid process. In the case of enlargement of a cervical lymphatic gland, and in “face-ache,” the swelling would be found lower down, the præ-mastoid hollow not being effaced. The parotid enlargement thence extends some way down the neck, and over the masseter muscle. The other parotid gland may likely be attacked. The axillary temperature may be raised four or five degrees, but there is rarely any redness of the skin over the swelling.

The **prognosis** is favourable ; the worst that

can be feared is the occurrence of glandular abscess, and an attack of inflammation of the membranes of the brain; these complications are, however, very rare. Nevertheless, either from subsequent tympanic catarrh, or from direct affection of the auditory nerve, temporary or permanent deafness may supervene.

Metastasis to the testicle is an occasional feature of the disease. It is most likely to take place on the disappearance of the enlargement of the parotid gland, and in rare cases the cessation of the orchitis may be the sign for recurrence of the parotid trouble. In females the mamma or ovary may be similarly affected, or œdema of the vulva may appear. But these complications are far less likely to occur in children than in adolescents.

It has been suggested that orchitis may be produced by an extension downwards of the inflammation, through the deep cervical fascia, the pleura, and the peritoneum. The theory is ingenious; but though the cervical fascia may be implicated with the parotitis, pleurisy is an extremely rare association. The probability is that inflammation of the testis, ovary, or mamma is but another local expression of a constitutional affection which shows itself by preference in idiopathic parotitis. If this be so, the theory of "metastasis" must fall to the ground.

Treatment.—On the earliest suspicion of infection the child should be strictly isolated, and if the constitutional disturbance be severe, he had better be kept in bed; certainly he should not be allowed to run about the house or to go out of doors. The diet should consist of milk and slops; ice may be given to suck. A dose of grey powder or castor oil may be desirable; an ointment of belladonna may be smeared over the painful area, and a pad of cotton-wool secured by means of a soft handkerchief. Leeches should be applied only when the inflammation threatens

suppuration. The attack having passed off, change of air, and a course of iron and cod-liver oil, or of other tonic, may be desirable.

(For malformations of the ear, *see* page 179.)

A foreign body in the ear may generally be removed by a pair of fine forceps, provided that it have not passed right down the meatus. But if it be round and smooth, like a pea, and do not offer a hold for the forceps, it is better to place the child at once under the influence of chloroform, and, even at the expense of wounding the integument of the meatus, to get the blade of a curette, or a bent wire, behind the foreign body before attempting extraction. It is injudicious to struggle with the child, and so to run the risk of pushing the body farther down, or to try to get it out by syringing, unless the stream can be introduced behind it. Much damage may be done by an uninstructed person attempting extraction; thus the body is almost sure to be forced through the narrow part of the meatus. If the syringe be used, the auricle should at the same time be pulled upwards and backwards, so as to facilitate the escape, and the nozzle of the syringe should be applied to the roof of the meatus. Mr. Hutchinson advises that a loop of flexible wire, or that two loops at right angles, be passed beyond the foreign body; thus its extraction may be effected without risk of wounding the tympanic membrane. The scoop and the forceps are dangerous instruments.

If much swelling and inflammation of the meatus have been caused by irritation from the foreign body, or by unsuccessful attempts at its removal, leeches should be applied in front of the tragus. After the inflammation has subsided, the syringe may easily remove the foreign body; but one should not attempt extraction so long as the slightest tumefaction is present.* A foreign body which has passed through

* George Field, "Diseases of the Ear," p. 40. 2nd edit.

the narrow part of the meatus may lie loose at the bottom of it without creating disturbance, whilst clumsy attempts at removal may destroy the tympanic membrane, and possibly give rise to a fatal otitis and meningitis. When *insects crawl into the ear*, they are readily killed by a few drops of olive oil.

Suppurative otitis is apt to follow on scarlet fever and diphtheria, or it may be the result of a simple acute or chronic otitis, especially in the strumous subject. The *membrana tympani* having been destroyed, the meatus is full of offensive pus. Such discharge may continue year after year, without apparently much distress of any kind; occasionally, blood is mixed with the pus, and the ossicles may be detached and discharged.

Before an abscess has burst, the acute inflammation of the tympanum will be associated with great constitutional disturbance; the face may be flushed, the head thrown back between the shoulders, and, if old enough, the child will complain of "headache," or pain in the ear. In his essay in the "*System of Surgery*" Dalby writes: "I may here be allowed to say that I feel confident that the convulsions of children are often due to brain irritation from an inflamed tympanum." The remark is of great importance. The ear does not receive the attention which it deserves in urgent and obscure nervous conditions in childhood. In some of these cases the child is desperately ill, and even unconscious, with, perhaps, a temperature of 104° ; possibly, also, he is attacked with convulsions. He cries constantly, and can neither eat nor sleep, and his pupils may be of unequal size.

Treatment.—If examination with the speculum show the membrane reddened and bulging, a sharp-pointed, slender knife may be passed down to and through the membrane; if pus escape, the symptoms will at once abate. Though puncture of the membrane

is not, perhaps, a very desperate procedure, it should not be adopted as a mere speculative measure. If the case be obscure, it will be advisable to put three or four leeches behind the ear, and to cover the pinna with a warm bread poultice ; a little warm oil, mildly carbolised, may be dropped down the meatus.

In **strumous otorrhœa** there is a mucous or muco-purulent discharge from the external meatus. Sometimes the discharge continues for months or even years, and occasionally it is streaked with blood. Often it is associated with an unhealthy condition of the mucous membrane of the pharynx or nares, the disease having spread thence along the Eustachian tube. Possibly the trouble may be caused by chronic inflammation in connection with enlarged tonsils, by cold, or by a sore throat, the result of faulty domestic hygiene.

In every case of otorrhœa the meatus should be examined with a speculum, for which purpose a careful irrigation with warm water, and subsequent drying, may be needed, the child being anæsthetised if expedient. If the discharge be caused by the presence of a foreign body, or polypus, the treatment becomes evident. But if, either with or without rupture of the membrane, the discharge be associated with struma, it may for long defy treatment (page 11). But if the child's health improve, he will probably grow out of the disease. Attention should be given to the condition of closets and sinks ; freshness of the air is very essential.

The **treatment of otorrhœa** divides itself into the adoption of general and local measures. Amongst the former must be reckoned warm clothing, healthy surroundings, an occasional change of air ; iron, cod-liver oil, quinine, and good wholesome food. Amongst the local measures will be included frequent syringing of the ear with a warm and very mild

solution of Condy's fluid, *sanitas* or carbolic acid. The irrigation should be carried out with patience and persistence, and without the expectation of immediate result. A few weeks, or even months, of the treatment may show but little improvement. The syringe should not be used every now and then, but with perfect regularity, as, for instance, after every meal. The meatus should then be dried, and finely-powdered iodoform should be blown into it from a quill or insufflator.

Prognosis in otorrhœa.—Children, with a general supervision, outgrow this disease; but as regards the persistence of hearing on the affected side, nothing definite can be predicated; very often, after severe and long-standing otorrhœa, the sense is but little affected, whilst in other cases, or after a short attack, total deafness results. This is particularly likely to follow the loss of the ossicles, though if the stapes remain to block up the opening into the vestibule, hearing may be but little affected. The loss of the malleus and incus alone may not entail serious result. Then, as regards life, on account of the close proximity of the tympanum to the cranial cavity, there is a grave chance of inflammation extending through the thin osseous plate which separates the middle ear from the dura mater, and of meningitis and encephalitis ensuing. Inflammation extending to the neighbouring lateral sinus determines there a fatal thrombosis. The clotting may extend from the sinus down the internal jugular vein, and even to the heart.

The diseased area may be a centre from which purulent absorption may take place, death resulting from pyæmia, after the occurrence of convulsions and rigors. In the case of an infant who was recently admitted into hospital for suppurative arthritis of each elbow-joint, *post-mortem* examination showed that the pyæmic infection which caused death was secondary to a chronic inflammation of the middle ear, with suppurative disease

of the temporal bone. Sometimes death occurs rapidly from suppurative otitis ; at others the child grows slowly weaker, and sinks from exhaustion.

Post-auricular abscess.—Inflammation may extend backwards from the tympanum in the masto-petrous bone, and, partially destroying that tissue, show itself as abscess behind the auricle. A softish tumour covered with dusky skin then appears ; it raises the pinna, and thrusts it forward. There may be much pain, headache, and constitutional disturbance.

Treatment.—The swelling should be incised forthwith, even if fluctuation be not evidenced, and provision should be made for drainage. If the mastoid region appear soft or carious, the end of a director may be introduced into it, with the hope of ensuring a free outlet for pus. Often such abscess is secondary to **caries** or **necrosis of the temporal bone**. In one case which was lately under treatment at the Children's Hospital, the patient was extremely ill until the abscess was evacuated ; at the same time the mastoid bone was scraped with a blunt director, and the cavity washed out with corrosive sublimate solution (one in two thousand). Rapid convalescence at once set in. In all these cases finely-powdered iodoform is found of great service in checking offensive odours, and in producing a more healthy condition of the parts. Occasionally sloughs of the temporal bone are cast off ; and the entire masto-petrous bone may be detached as a sequestrum, and yet the child may recover. A child was recently in hospital in whom, months previously, such necrosis had taken place ; total deafness of that side and facial paralysis had of course resulted. (*See also Proc. of Med. Soc. Lond., vol. viii. p. 162.*)

CHAPTER XV.

HARE-LIP.

THE median part of the upper lip is formed by a flap which descends, in connection with the fronto-nasal plate, from the front of the cranium ; the lateral parts are developed from the coverings of the superior maxillary processes, which, extending inwards, are eventually fused with the descending flap at a short distance from the median line (Fig. 21).

If a unilateral arrest of development take place, a single hare-lip results ; if the arrest be symmetrical, the cleft is double. The labial cleft is thus to the side of the median line, not *in* it, as it is in the hare. The cleft may extend into the nostril ; or may be represented merely by a faint notch or depression at the border of the lip. Sometimes a small triangular gap is found continuous by its apex with a vertical linear cicatrix, as if Nature herself had attempted a plastic operation with partial success. Hare-lip may be hereditary, several members of the same family being disfigured by it. Often it is associated with cleft palate, and the median piece of the lip may be attached with the intermaxillary bone to the projecting nasal septum (Fig. 27).



Fig. 25. — Single Hare-lip.

When the child cannot suck, the mother's milk should be drawn by a breast-pump, and administered in a warm spoon. But if this cannot be done, fresh cow's milk and water (page 12) must be substituted. For feeding, the infant should be held upright, so that the fluid may run easily into the pharynx, the slipper-bottle being provided with a very large indiarubber teat with a hole below the end, through

which the milk may be drawn or poured. Or the milk may be gently injected into the pharynx by a glass syringe, a piece of soft rubber tubing having been slipped on to the nozzle.

If he be sick, probably he is over-fed, or food is given in too large quantities, and, perhaps, at too long intervals; or, may be, the cow's milk is not sufficiently diluted; but a hurried recourse to condensed milk and the patent foods should not be adopted. He

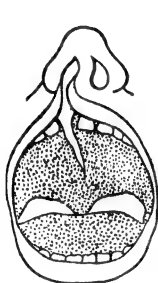


Fig. 26.—Single Hare-lip, with Cleft of Hard Palate. (After Mason.)

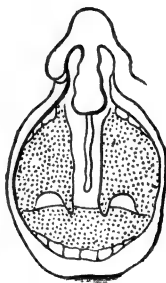


Fig. 27.—Double Hare-lip, with complete Palatine Fissure.

should be covered in flannel, and his body and limbs rubbed after the morning and evening warm bath with cod-liver or olive oil.

The proper age for operating.—The child should be in the best state of health, and in the most favourable surroundings. If the cleft be slight, and do not materially interfere with sucking, the operation may be conveniently deferred until after the child is weaned. When unassociated with defective roof of mouth, the child will be able to take the breast on the rift being closed; in such cases the operation may be undertaken with advantage within even a few days of birth. Possibly, at this very tender age, the risks of

the patient suffering from the effects of hæmorrhage or shock are greater ; but for the sake both of mother and child the defect should be remedied within the first few weeks if the general condition appear satisfactory. If, however, a defective palate co-exist, the operation may be deferred for weeks or months, as the power of sucking could not be improved ; strength will be gained by the delay. It is highly important to afford the infant the power of feeding from the mother's breast. The nurse who can produce a well-nourished infant with hare-lip and cleft palate deserves high praise ; many such infants perish from sickness, diarrhœa, and exhaustion.

If the palate be cleft, or if, for some other reason, the operation be deferred, unusual care will be required for proper nourishment. Infants thus affected are often so thin and miserable that the surgeon is compelled to postpone the operation, so that the physical condition may be improved. After the lip has been operated upon, the width of the palatine cleft begins to diminish.

Operation for simple hare-lip.—The upper part of the infant's body should be surrounded with a towel so that the arms may be secured. Chloroform should certainly be administered. In private houses a low chest of drawers forms an excellent operating-table. This should be brought up to the window for the sake of the light.

The first step consists in incising superficially the mucous membrane where it is reflected from the back of the lip into the gum, and then tearing it up with the handle of the scalpel, so as thoroughly to free the lip of its attachments far out on each side of the fissure. On the one side of the fissure the mucous membrane is dissected off from the nostril well out on to what should be the proper border of the lip. This is done by transfixing with a thin narrow-bladed knife, of

the size of that used for tenotomy, and with the help of a delicate pair of forceps this slip is to be completely detached. The assistant should have compressed the coronary artery between his finger and thumb; it is lying immediately beneath the mucous membrane.

Upon the other side of the cleft the mucous border is liberally raised by transfixing the lip well above the line of the mucous membrane. This second flap is not to be detached, but is to be brought across the middle line, and its raw surface applied to the vivified edge already prepared upon the other side of the cleft, any redundancy being removed after the sutures have been applied. That side of the lip should



Fig. 28.—Preparation of Labial Flap.

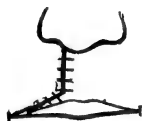


Fig. 29.—Flap secured.

be chosen for this flap which seems best adapted for supplying a symmetrical and adequate prolabium.

If the sides of the lip be well compressed but little blood is lost; but if the assistant cannot be relied upon for compression, the end of the coronary artery may be caught, and held in a slender pair of torsi-pressure forceps. During the progress of the operation blood is kept from flowing into the mouth by the use of torn sponge. The pieces should not get adrift into the mouth, however.

The sutures are of fine wire, or horse-hair softened in warm water; they should be used liberally, and especially so near the border of the lip. The lip should be carefully everted so that some sutures may be inserted in the posterior aspect. These last sutures are important; they keep the depth of the wound free from the irritation of saliva and food, and help to

secure strength in the union ; I take as much pains in adjusting the sutures at the back of the fissure as at the front, and have entirely given up using pins in operating. The sutures, supplemented by the strapping, entirely suffice for securing rest and union ; and, moreover, the site of the pins was apt to be permanently marked by a white scar. A piece of lint may be arranged under the strapping, along the line of the incision. The use of collodion is not necessary. The introduction of waterproof strapping has rendered Hainsby's cheek-truss a thing of the past.

The face being washed and dried, the cheeks are drawn well towards the middle line, and a piece of Seabury and Johnson's adhesive rubber plaster, cut somewhat in the shape of a canoe-paddle, should fix the lips, so that there may be no strain on the sutures. The strapping is very narrow over the lip. On the day after the operation some of the sutures, especially those most distant from the border of the lip may be withdrawn, but without the least disturbance of the wound, the cheeks being drawn well together, and a fresh piece of strapping being applied. Next day more of the sutures should be taken away, and by the third or fourth day even the fine hair stitches will have done all the good which can be expected of them, and must be taken out. Those at the back of the lip can be left, however, to work out, as they will leave no visible scars.

If primary union do not occur, none the less care must be given to keep the granulating edges in close contact, attention being paid at the same time to the general state of health. Union by granulation may give most excellent results. Idle granulations may be gently stimulated. If union take place by first intention, the child may be put to the breast on the fifth or sixth day after operation, not earlier, lest the slender flap which has been brought along the margin of the

lip be disturbed. The mother should keep up the supply of breast-milk until the infant can take it naturally. In the case of a child being taken into a general ward for operation, it is well that the mother be also admitted (even though she have no milk for it), provided that she can be trusted to look after it. The child will need close and constant attention; and at first after closure of the labial gap he may need help during inspiration, either by the introduction of indiarubber tubes through the nostrils, or by the de-



Fig. 30. — Imperfect Adjustment of Mucous Membrane.

pression of the tongue by a spatula, or by a tube. It may be some time before the air finds its way in spontaneously.

Appreciation. — The advantage of operating by a thick labial flap is the avoidance of the notch so often found after the old operation; instead of the notch, a natural fulness may be thus obtained. The scar also is less recognisable when thus deflected. The mucous membrane must be carefully adjusted; a satisfactory result may be marred by an unevenness in the red line (Fig. 30). A slight secondary operation at a later period may be needed to give a finishing-touch. In paring or adjusting, the border line of skin and membrane must be carefully followed, as it is very possible to remove too little membrane.

If double hare-lip be uncomplicated with intermaxillary prominence, the mucous membrane must be dissected from the entire circumference of the median flap as well as from the opposed borders of the lip; but from one side, or even from both sides of the lip, thick, useful flaps must be borrowed for deflection across the middle line. This is an important economy of tissue, only that which is found superfluous on adjusting the vivified surfaces being cut away, thus the natural fulness of the lip is preserved.

Hare-lip may be complicated by **projection of the intermaxillary bone**. The number of incisor teeth eventually to be developed from this projection may be two, three, or four—often only the central incisors. If the intermaxillary bone be associated with single cleft, it will probably contain three incisors. With double hare-lip the projection may prejudice a satisfactory result. The question arises as to what shall be done with it. In some cases it will be well to remove the intermaxillary bone rather than to force it back and cover it in; but this is the exception. When it is removed, its covering may be utilised, the skin being brought down to form perhaps a nostril septum. It may be urged that if the bone be pushed back the central incisors will grow irregularly; but if the dentist cannot then improve their position, he may extract them. Sometimes the sides of the process may require trimming before it can be pushed into the cleft, in which case the adjacent sides of the cleft should be carefully vivified as well. If it be taken away the incisor teeth are sacrificed, the mouth is made small, the new upper lip hangs flat and depressed, and a mass of tissue, which might be very serviceable in the subsequent closure of the cleft palate, is lost. When the intermaxillary bone is growing from the tip of the nose, as sometimes happens, it must inevitably be sacrificed.



Fig. 1. Double Hare-lip in Process of Operation.

The rule should be to try and save the intermaxillary bone. If it be not very prominent the lip may be operated upon without heed of the bone; constant pressure of the lip will cause its gradual recession. When the bone is attached on one side it may be pushed back by the thumb, or twisted back by sequester forceps, the blades of which have been wrapped

round with lint, so as to diminish the bruising. The lip may be operated upon on that or a subsequent occasion. If the bone be free on each side, but firmly attached to the septum, it may be forced into its proper position after the removal of a wedge-shaped piece from the bony septum, by means of scissors or cutting forceps. If hæmorrhage follow, it is certainly advisable that the rest of the operation be not undertaken until after some days, by which time there will have been recovery from the shock. The cautery at a dull heat may arrest the bleeding.

CHAPTER XVI.

CLEFT PALATE.

THE roof of the mouth is formed from fusion of the palatine processes with each other (and with the descending nasal septum) in the middle line. The natural developmental cleft is in the exact median line; but at the front it extends forward on each side of the intermaxillary bone. Double hare-lip is almost invariably associated with cleft palate. The cleft may implicate the roof of the mouth from behind the central incisors to the tip of the uvula (Fig. 27). Sometimes the uvula alone is fissured, or the defect may extend forward from it into the soft palate, or into the back of the hard palate; or with a single or double hare-lip the cleft may be confined to one border of the intermaxillary bone. If only the soft palate be cleft, the power of sucking will be limited, and the spoon will be required to ensure sufficient supplies. Sometimes, with the help of a large hollow indiarubber teat, the child with defective hard palate

may be able to suck fairly well. An infant may be brought for advice because, although it takes to the breast greedily, it is growing daily thinner. On examining the back of the mouth a cleft may be discovered, implicating the soft palate and uvula.

At first much of the fluid passes out through the nose; but if attention be paid to the position given during the feeding (page 225), and as the muscles of deglutition grow accustomed to the defect, improvement takes place. The voice is peculiar and unpleasant; if the child grow up with the defect unrelieved, speech is only partially intelligible, the letter *S* being altogether unpronounceable. Even after the cleft has been closed, if the operation be performed late in childhood, the intonation is but slowly and partially improved; it is, therefore, advisable to operate at as early a date as possible.

The age for operation is in the third year; formerly it was considered advisable to postpone interference until puberty, so that the patient might assist the surgeon by clearing the throat of blood and mucus, but with the systematic use of chloroform this is altered.

Cleft palate has been successfully operated on within the first year, but at so tender an age tissues are soft and flaps apt to tear across; moreover, the shock occasioned by interference and loss of blood may prove fatal. Till the child begins to try to talk but little can be gained by the attempted closure. Carious teeth should have been extracted some time previously. At the time of operation the child should be in the best of health, and before the operation his temperature should be taken as a precaution.

The operation is long and tedious. Chloroformists and assistants should be well up to their work. An assistant, or skilled nurse, at the back of the head will be wanted for the charge of the gag;

the chief assistant will stand on the left of the patient, opposite the operator, and be ready with instruments. A nurse should make herself responsible for clean sponges, some of which are firmly secured on holders, some in scraps. Selections from "sponge clippings" as supplied from the shops are useful; they should be fresh for every operation. Bleeding during the progress of the operation can generally be controlled by the firm and judicious pressure of a piece of sponge. The instruments are on a table at the operator's right hand. In private houses the top of a low chest of drawers serves for table excellently; it should be brought to a good light. The mattress should be firm, and an inflated indiarubber pillow should securely support the head; as the operation proceeds, the pillow may be made fuller or flatter as is desired. When working behind the incisor teeth, air may be let out. Or the child's shoulders may be raised and the head allowed to hang back, that the blood may escape into the nares rather than into the pharynx; my experience of this plan is decidedly favourable. The mouth is kept open, and the tongue depressed by a Smith's gag of proper size; the needle is the tubular one of M. Sims, with a continuous supply of wire upon a reel at the end of the handle.

For cleft of soft palate.—The half of the uvula is caught in toothed forceps and transfixed by a long, fine-bladed knife, and the mucous membrane liberally pared along the cleft and round to the very tip of the other half of the uvula. Then a slight pause may be made, if advisable, whilst a soft sponge is pressed up into the cleft to check the bleeding, and whilst more chloroform is being administered. Plenty of fine-wire sutures are inserted down to the very tip of the uvula, twisted up, and cut short. Thus the soft palate is closed up; but if the fingers be gently pressed against it, it will be found so tight that the sutures

would assuredly cut their way out unless the tension be eased before the child is put to bed. If it be thought expedient to twist up any individual suture, lest the strain put upon it be too great, it may be left for the present and tightened up by the torsion forceps after the tension has been relieved. (*See next page.*) Following the example of Mr. Clutton, I have successfully operated upon a cleft of the soft palate in a healthy infant of six months.

For cleft of the **hard palate** the edges of the gap are pared as described above, and an incision is then made from before backwards along the inner border of the alveolar process, so as to define the outer margin of an oblong flap of muco-periosteum which is to be detached by the use of the angular knife and raspatory, and shifted inwards. The lines of these incisions are dotted out on Fig. 32.

The posterior part of the flaps and the front of the halves of the soft palate will be freely separated by working backwards through the cleft, between the bone and periosteum, with the blades of a small pair of scissors much curved upon the flat, and by dividing with them the aponeurosis which spreads from the soft palate into the under surface of the hard.

The flaps are stitched together as was done with the soft palate, and the operation is complete, with the exception of making the longitudinal cuts through the substance of the posterior part of the soft palate parallel with, and on either side of the median line. These incisions are best made with a sharp tenotomy knife; thus those fibres of the levator and of the

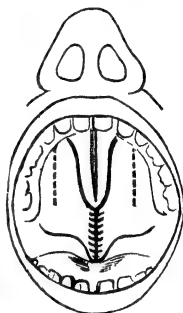


Fig. 32. — Complete Cleft; soft palate sutured.

tensor palati and of the palato-pharyngeus are surely divided, which by contraction would else have interfered with the union of the applied edges. Sometimes the tension in the front of the soft palate may be eased by continuing backwards the lines dotted out on Fig. 32. At other times separate incisions may be made with the tenotome, and freely enough to take off all tension. They do not cause the flaps to slough, but are quickly filled up with granulation tissue. Much will depend upon the thoroughness with which these incisions are made.



Fig. 33.-
The Double
Hook.

The operation for complete cleft need not be divided into two stages; the soft and hard palate may be treated at the same time. Indeed, to close a cleft in the soft palate it is generally necessary to interfere with the muco-periosteum and the aponeurosis at the back of the hard palate,

When there is difficulty in detaching the muco-periosteum from behind the incisor teeth, a very small angular knife and a well-curved raspatory will be found of great service; and whilst the friable edges are being stitched together, the double hook may be used instead of forceps (Fig. 33). Horse-hair softened in warm water may be used for suturing, and may be introduced by a fine rectangular needle.

Sometimes the success of the operation is partial; a common site for the failure of union is at the junction of hard and soft palate, but such apertures may be completely filled up by granulation, or they may be obliterated by the subsequent growth of the bone and soft parts.

One girl was operated on three or four times, with only a partial success on each occasion; the very wide palatine cleft was ultimately obliterated by chiselling through the palatine arch, and by working

the pieces in towards the middle line. The operation of cutting the bone should be resorted to only in those cases in which the coverings are unusually thin or their edges far asunder. These flaps of bone and membrane may be steadied together by passing a large wire suture around them by means of an aneurism needle.

After-treatment.—Night and day for a time the child must be watched, or his hands tied, lest he get his fingers or toys into his mouth. If his arms be run through a stiff tubular splint, so as to prevent his getting up his hands, he will not need such constant supervision ; but he must be thoroughly amused and petted when awake to keep him from crying or screaming. On no account must he be allowed to talk ; every wish, so far as is possible, must be anticipated. If old enough, he can make his wants known by the slate. Toys and picture books will help to while away the time, and if the child be good, and the weather fine, he need not be kept in bed or indoors for more than a day or two ; it is, I am sure, advisable to get the child into the fresh air as early as possible.

Soon after being put to bed he may vomit the blood swallowed during the operation, after which he will be quieter ; the sooner the sickness is over, the better. For some hours he should take nothing but a little iced water, which is carefully poured into the mouth by a spoon ; for some days subsequently all food should be fluid ; later on he may have jelly and soft pudding, or a little finely-pounded meat or potato moistened with gravy.

The result of the operation should not be inspected until seven days have elapsed, by the end of which time the child will have regained confidence. All the stitches may be left to work their own way out ; I have found them harmlessly embedded in the mucous membrane at the end of a year.

Unfortunately the surgeon cannot command success in these operations, and sometimes he finds on making his first inspection that the time, care, and ingenuity which he gave to the operation have been of no avail; that the sutures have cut adrift, that the edges of the cleft have entirely or in part come asunder, and that the neighbourhood of the wound has an angry look, and is covered with a mucopurulent slime. The cause of the disappointment is more likely to rest with the patient or his hygiene, than with the operator. So, at least, I am wont to think. Sometimes after the operation the child is attacked with scarlet fever or diphtheria.

After operation, improvement in the voice is but gradual; it may be hurried on, however, by patient and methodical instruction. The child should be shown the exact movement of the lips and tongue of the teacher when the difficult words are being pronounced, and he should be made to imitate these movements with care and diligence over and over again. A person accustomed to teaching deaf mutes would give very helpful instruction.*

CHAPTER XVII.

FOREIGN BODY IN WIND-PIPE—SCALD OF FAUCES.

By a natural instinct little children put everything up to or into the mouth. In the latter case a small body, such as a bead, button, coin, or seed, may be carried with the inspired air, and "go the wrong way." Or, from careless feeding, small bones or fruit-stones may enter the larynx. The substance may be lodged in

* See Haward's paper in *Lancet*, January, 1887.

the larynx, or it may pass into the trachea or one of the bronchi, more likely the right, as it is the larger.

If it be *lodged in the larynx*, spasmodic coughing is at once set up, and this may have the effect of causing its expulsion. The spasm is due to peripheral irritation of sensory nerve filaments, but at periods the respiration is perfectly easy. If the body remain, the coughing continues, and, inflammation attacking the mucous membrane, respiration becomes difficult and insufficient. There may be evident tenderness at the thyroid region. The dyspnœa is paroxysmal, and the child clutches at his throat or stuffs his fingers into his mouth. The voice is altered, and the face becomes red and dusky, the veins swell up, perspiration is profuse, and exhaustion advances.

The laryngoscope affords no practical information. The child resists the introduction of the mirror, and if, with the help of chloroform, an inspection be made, nothing, probably, is seen but swollen tissues and frothy mucus. The history of the case and the suddenness of the attack suffice for the diagnosis; and possibly the child shows by signs what has happened, or states clearly that he has swallowed something with which he was playing just before the attack came on.

Treatment.—A thorough digital exploration of the upper opening of the larynx is made; and, this failing, the administration of an emetic (sulphate of zinc) may procure the liberation and ejection of the body. If this also fail, the child must be inverted and roughly shaken, and slapped between the shoulders whilst he is held in the inverted position. In case of the glottis becoming blocked during the process, tracheotomy would be demanded; so that preparations for the operation should be deliberately made beforehand.

If the symptoms increase in severity, the probability of the child dying in one of the attacks of

dyspnœa is great; tracheotomy must therefore be performed forthwith; and after the operation, the larynx may be probed from below, the tube (if one have been temporarily introduced) being removed for the purpose. Or a wire and bristle pipe-stem cleaner may be passed up between the vocal cords, under the pilotage of a filiform catheter. If necessary, the inversion and shakings are again to be gone through, the larynx being explored from below.

If the conviction be strong that the foreign substance remains in the larynx, the incision must be continued in the median line, through the cricoid and thyroid cartilages, the alæ of the thyroid being held asunder, and the interior examined. The fact of the tracheotomy greatly relieving the dyspnœa is presumptive evidence of the body being lodged in the larynx. (*See page 57.*)

If a foreign body have *passed into the trachea* or bronchus, it will probably be driven up to the glottis from time to time, with expiration, when it will cause spasmodic respiration and coughing. The child may be sensible of the body being moved in the trachea; or with the stethoscope its movements may be ascertained by the surgeon. The voice will not be altered, as would be the case if the body were impacted in the larynx. If the bronchus or one of its divisions be plugged, the corresponding lung-tissue becomes collapsed or œdematous; at any rate, the stethoscope placed over it may convey no murmur of tidal air; or the air may pass the obstruction with a peculiar whistle. When a child is suspected of having swallowed a foreign body, and an area of the lung is found tideless, there is little room for doubt, even though temperature be normal and there be no other sign of disturbance. If the bronchus were plugged during inspiration, the lung-tissue which is implicated would be full of air (at any rate, for a time), but there would be no

breath-sounds; afterwards pulmonary œdema, with dulness on percussion would supervene. The earlier that the operation is performed, the greater the prospect of a successful issue.

Whatever the position of the foreign body, whether in larynx or trachea, tracheotomy, high up, is the operation required. Low operations upon the trachea are difficult and dangerous. After operation, artificial respiration may be required. This is best accomplished by slow and rhythmical compression of the elastic chest-walls. (For operation, *see* chapter iii.)

The edges of the tracheal wound may be drawn apart by the self-holding forceps, and the child should be laid prone, with the head hanging over the edge of the table, and sudden pressure may be made over the back of the chest synchronous with expiration. It may be convenient to stitch the sides of the opening in the trachea to the edges of the skin-wound.

Possibly when the opening in the trachea is made, the substance will be expelled, with blood and mucus, in a violent fit of coughing; but if not, attempts to extract it must be deliberately but gently made by slender curved forceps passed down the bronchi in the direction of the tideless lung. Durham's flexible forceps, which work in a spiral wire, are excellent for the purpose, but the exact make of the blades of the forceps must depend upon the nature of the body to be extracted.

If these manœuvres do not succeed, a loop of stiffish copper wire, bent near the closed end, should be passed down, in the hope of snaring and withdrawing the substance, or with the idea of setting it free either by actual disturbance or by coughing. If every attempt fail, the edges of the tracheal wound may be kept permanently apart by a couple of strong sutures passed through each side, the child being encouraged to lie prone; on subsequent occasions renewed efforts

may be undertaken. A tube must not be worn, or the substance would have little chance of escaping.

But if, by good fortune, it have been extracted, the tracheal wound should be at once closed by fine sutures, the skin wound being also closed except where a small drain is laid, so that there may be risk of neither cold air or purulent discharge entering the wind-pipe.

If, in spite of attempts at extraction, the body remain, obstructing the bronchus, the surgeon will reluctantly abstain from further interference, and the tracheal wound must be allowed to close. Mucus, blood, or pus, may be expectorated; and possibly after days, months, or years, the substance may be expelled through the larynx in a fit of coughing. Its presence might likely cause abscess in a part of the lung, or give rise to fatal hæmorrhage or septicæmia. Or an attack of pleuro-pneumonia being associated with localised abscess, the substance might escape through an intercostal space.

Scald of fauces.—A common childish trick is to put the mouth to the spout of a teapot, or of a kettle upon the fire, and suck. If the mouthful of fluid thus drawn up be very hot, acute inflammation and œdema at once come on, with pain and dyspnœa; the symptoms appear with great suddenness. The œdema may similarly be due to the child drawing flame when its clothes catch fire. Œdema extends to the level of the vocal cords, but not below them.

Treatment.—The hot sponge, or leeches, may be applied, and two grains of calomel given every hour, until a definite effect is produced. Or two minims of antimony wine with half a minim of tincture of aconite may be given every fifteen or twenty minutes. And small doses of a mixture of cod-liver oil and lime-water may be frequently swallowed as a soothing application to the inflamed membranes.

It is not improbable that intubation of the larynx (*see* page 27) may be found efficient treatment in these cases, for the œdema is local and transient, and the pressure of the tube against the swollen tissue will hurry on the absorption of the infiltration.

In the case of great urgency, it would likely prove very effective, I think, if an ordinary soft catheter were passed along the floor of the nares, and the point, guided by the fingers in the mouth, gently introduced through the swollen glottis.

There must not be too hurried a recourse to tracheotomy, as much of the dyspnœa may be due to simple reflex irritation, which may be allayed by treatment. When, however, the dyspnœa is extreme it would not be safe to leave the child without having performed tracheotomy. Too much reliance should not be placed in scarification of membrane; indeed, how could one be sure of scarifying the swelling over the rima without doing serious damage to the cords?

Prognosis is favourable unless the burn has been extensive. The most likely causes of death are shock, and secondary complications in the lungs—putting on one side, of course, the risk of fatal dyspnœa.

CHAPTER XVIII.

SPINA BIFIDA.

A VERTEBRA has three primary centres of ossification, two for laminae and one for body. The laminae are fused in the root of the spinous process. If development be arrested, the spinal canal remains unclosed posteriorly, the membranes with the cerebro-spinal fluid protruding as a soft tumour. This pathological condition is termed *spina bifida*; it is found

most often in the lower lumbar and sacral region, for there the laminæ are last solidified. It is possibly caused by an increase in the amount of cerebro-spinal (subarachnoid) fluid within the spinal canal, whereby development is prevented; thus it is often associated with hydrocephalus. But whether the collection of serous fluid be the cause or the result of the spina bifida has not yet been absolutely determined.

The tumour may be so large at birth as to mislead the obstetrician as to the true nature of the presentation. The most characteristic feature of the tumour is its exact median situation, and its firm attachment to the deep parts; it is rounded, but if a number of neural arches be undeveloped, the base will be elongated in the axis of the column. When not over-distended, stunted ridges of bone may be felt on either side of its root.

When the child screams, some of the cerebral fluid is displaced from the interior of the skull and into the spinal canal, the tumour becoming more tense; and by gentle compression of the tumour some of the fluid can be squeezed into the cerebro-spinal canal, with the effect of causing irregular muscular movements or even convulsions, and of making the anterior fontanelle bulge.

Though the membranes are fused with the skin, the wall of the tumour may be thin, translucent, and threatening rupture. Sometimes it yields spontaneously, the subarachnoid fluid escaping; or the wall may be but a thin membrane, through which the fluid oozes or quickly escapes by ulceration. The wound may then close and the sac may refill and burst again, each escape of fluid being associated with convulsions. Eventually such a case may end in spontaneous cure, but far more probably in death.

At other times the skin is thick, leathery, and wrinkled, translucence and fluctuation being absent.

Often the deformity is associated with imperfect innervation of pelvic viscera, with arrested development of the lower extremities, or with club-foot.

Sometimes the sac contains no nerve cords or branches ; at others the nerves are spread over its inner surface. In rare instances the sac is lined by the substance of the cord itself, the serous fluid being contained in the immensely dilated central canal of the cord. This is likely to be associated with internal hydrocephalus. If the cord or the large nerves of the cauda equina be in the sac, they mostly occupy the median part. A median dimpling of the skin suggests adhesion to the spinal cord.

The **prognosis** is extremely unfavourable. Pressure against, or injury to, the sac may cause ulceration or sloughing, when, the fluid escaping, death quickly supervenes, after convulsions ; or spinal meningitis, myelitis, and softening may complete the history.

The same contingency frequently follows treatment of the sac by aspiration, puncture, ligature, or excision. On the obliteration of a spina bifida, hydrocephalus may ensue. I have seen several cases in which a gradual shrivelling of the sac, and its eventual obliteration, have taken place spontaneously. As a rule, however, the sac becomes so tense and thin that a fatal yielding takes place in early childhood.

The cases most amenable to *treatment*, or likely to undergo spontaneous obliteration, are those in which only a narrow communication exists with the spinal canal. The more slender the pedicle, the less the probability of the sac containing nerve element. Colloidion may be painted over it with the view of compression. The first step to obliteration, either by nature or art, is the closure of the neck of the sac. If no operation be contemplated, protection should be afforded to the cyst by a moulded cap of guttapercha or leather ; even after operation such a shield may be

desirable. If the base of the tumour be large (and the communication with the spinal canal probably free), and the covering very thin; or if a tumour be associated with hydrocephalus, talipes, paralysis, arrest of development, or other congenital malformation, it is best that the spina bifida be left alone. Heroic treatment would bring discredit on the art, and disappointment to all concerned. For the first few weeks after birth no active treatment need be suggested; an opportunity should be given for the tumour to undergo spontaneous cure. But if after judicious delay the tumour undergo no change for the better, if the pedicle be small, and there be no association with other deformity, treatment may be undertaken, but with a full appreciation of the grave risks attending it. But if, as so often happens, the child be thin and ill-nourished, no active measure should be adopted; constitutional remedies are then needed.

Morton's method consists in the injection into the sac of a drachm of a preparation of ten grains of iodine, and thirty of iodide of potassium, in an ounce of glycerine. About a drachm of the fluid of the sac is first withdrawn, so that the tension may not be increased by the injection. The communication with the spinal canal may be shut off during the administration of the injection, if that be practicable.

A hypodermic syringe may be used, the puncture of the sac being made towards the side, so as to diminish the risk of wounding the cord or the large nerves. The advantage attending the use of this preparation is that, being heavier than the cerebro-spinal fluid, it is not diffused along the spinal canal, but sinks to the bottom of the sac, and there quietly, or with local excitement, produces a change in the tissues. If the child survive, the injection may have to be repeated several times.

Morton advises that injection be undertaken when

the infant is from three to six weeks old, for the tumour is apt to grow. The smaller it is for operation the better. The injection should be obliquely into the tumours and through healthy skin.

If only it were known that the sac contained neither cord nor nerve (unfortunately this information can rarely be obtained), a careful plastic operation might be attempted with antiseptic precaution, the edges of the sac being adjusted with fine suture. But convulsions and meningitis might follow on the disturbance of the sac.

Mayo Robson has described * four cases in which he excised the tumour under the eucalyptus spray, and approximated the cutaneous and meningeal flaps respectively by sutures. In the first case the infant lived a year ; in the second, death followed from marasmus, the wound having healed by primary union. In the other two cases an excellent result was obtained ; but had the cord and the nerves been extensively implicated in the sac, as happens in the majority of cases, such gratifying reports could scarcely have been shown. Methods somewhat similar may possibly have been tried at various times, and the results having been unsatisfactory, no publication of them has been made ; the subjects of speculative and unsuccessful operations usually have quiet, unostentatious sepulture. Robson's successes will probably stimulate surgical interest in these cases, and it would be well for our art if all the results, whether failures or successes, could be reported in due course.

By **false spina bifida** is meant a tumour which, taking its root within the spinal canal, escaping through the unclosed laminae, and appearing over the line of the spinous process, does not contain either spinal nerves or cerebro-spinal fluid. The nature of such tumours varies ; perhaps the most common example is

* *British Medical Journal*, April 4, 1885.

the shrivelled cyst-wall of a true spina bifida which has undergone obliteration. (*See also page 125.*) In one instance the tumour was associated with deficient innervation of the bladder; the mass had the appearance of a simple, subcutaneous fibro-fatty growth, and almost invited surgical interference. No operation was, however, undertaken. Probably the laminæ were deficient, but this could not be ascertained; the association with "weakness" of the bladder evidenced deep attachment. In proposing operation for a false spina bifida, the surgeon should assure himself, as far as possible, that its connections with the interior of the spinal canal, and with the interior of the pelvis, be not such as to preclude complete ablation. Careful digital exploration by the rectum should be practised before proposing operation.

Spina bifida occulta is that variety in which the defective neural arches are not associated with a bulging of spinal membranes; the adjacent skin is likely to be marked by a thick growth of hairs.

CHAPTER XIX.

SPINAL CARIES.

It is incorrect to speak of *spinal curvature* as a separate disease; it is but a symptom of disease, and may be associated with various pathological conditions. It may be due to general softness of the vertebræ, so that the column yields under the superimposed weight; thus it is found in the rickety child, or in the girl outgrowing her strength; but it is generally the result of vertebral caries. The differential diagnosis is found on page 252.

Vertebral caries, or Pott's disease of the spine, is a rarefying osteitis, beginning in, and sometimes confined to, the body of a single vertebra, but more often spreading to the adjoining fibro-cartilages, and into a long series of vertebræ. The disease rarely begins in an intervertebral disc. Probably its starting point is often that area of great physiological activity between the body of the vertebra and an epiphysial plate.

Sometimes the bodies of vertebræ in distant regions of the column are affected, whilst the intervening segments are apparently sound. Thus, in the same subject, the upper cervical and the lower dorsal vertebræ, or the cervical and lumbar regions, may be diseased. The caries may co-exist with disease of the hip or of some other articulation, with enlarged lymphatic glands, or with disease of the hand, foot, or one of the long bones. Often it follows scarlet fever or whooping cough, or some other exhausting disease.

Vertebral caries is generally traceable to injury, such as a fall downstairs, from the bed, perambulator, or the nurse's arms. But at times a child who is apparently in robust health, and who has met with no particular injury, is attacked. No child is too young to be the subject of vertebral caries.

From the gradual sinking together of the diseased segments, and the throwing out of the cement about the laminæ, the spine is bent and stiffened; nevertheless, the cord escapes compression, unless the angular deformity be extreme, or the disease have advanced so rapidly that the cord has not had time to adapt itself to the altering circumstances. In such unfavourable circumstances, compression may exist with but slight deformity.

As the disintegrating inflammation advances, the bodies of the vertebræ undergo absorption, whilst consolidating deposits of new bone may be taking place

about the laminæ and articular processes.' By these deposits the parts behind the spinal canal are converted into an admirable prop for the weakened column. But for this plastic deposit, what is left of the carious vertebræ would fall together, with the probable result of compression of the cord. Let those who would talk of straightening out a carious angle of spine ponder over this mechanical arrangement.

It is by ankylosis that nature is able to effect a cure; all that the surgeon can do in assisting is to keep the child in the best possible health, and to ensure absolute rest for the diseased segments.

Disintegration of the vertebræ is frequently associated with the formation of abscess, but in certain quiet cases the débris is absorbed by the capillaries and lymphatics as quickly as it is formed, so that no definite abscess occurs; this condition constitutes *caries sicca*; it is of common occurrence.

But though abscess have formed, the pus may undergo gradual absorption under the favouring influence of rest. The question of absorption of pus is, perhaps, only one of degree, for though in many cases of spinal caries no pus makes its appearance, still some must have existed, and if a small amount can be absorbed, why not a larger amount? (page 260).

Sometimes, though abscess threatens, the local disturbance quiets down and no pus appears, while convalescence sets in, even if it be not completely established. But later on, perhaps after injury or illness, the cheesy deposit which was left near the consolidated region becomes once more the seat of active pathological changes, and the suppuration which threatened months or years before makes its unwelcome appearance. This is known as a *residual abscess*; its treatment is that of an ordinary spinal abscess.

Localised spinal abscess.—If inflammation have matted the surrounding tissues into a limiting wall,

the abscess will be found close to the diseased segments. Thus pus from cervical caries may form *post-pharyngeal abscess* (page 267); from caries of thoracic vertebræ, *dorsal abscess*; from disease of the loin vertebræ, *lumbar abscess*. Suppuration which remains confined to the region in which it was formed is more amenable to treatment than that associated with infiltration or wandering. In the latter case long sinuses and inaccessible cavities complicate the treatment.

Often the matter is guided by fascial connections to distant parts, there to be confined or discharged. From cervical caries the pus may point in front of or behind the sterno-mastoid, or pass into the thorax to form a *mediastinal abscess*, whence it may be discharged into the trachea, bronchi, or œsophagus, or by the base of the scapula.

Pus from dorsal caries finds its way beneath the internal arcuate ligament into the sheath of the psoas; and *psoas abscess*, from dorsal or lumbar caries, may be guided by the attachments of the sheath of the muscle beneath Poupart's ligament and into Scarpa's triangle; rarely will it wander farther down the thigh beneath the fascia lata. As the abscess descends beneath the common femoral vessels, it renders them prominent and makes the pulsations of the artery conspicuous; the furrow of the groin is considerably effaced. The collection of matter is apt, by following the tendon of insertion of the muscle, to find its way on the inner side of the neck of the femur and to the buttock. The pus of a psoas abscess is not invariably within the sheath of the muscle; it may be in the connective tissue around it. There is generally a characteristic fusiform outline in the case of abscess within the psoas sheath. On rare occasions the pus finds its way between the abdominal muscles, and approaches the surface at the outer border of the rectus, at the external abdominal ring, or by the scrotum.

Spinal abscess may discharge itself into the duodenum, colon, rectum, or any neighbouring piece of intestine, or even into the bladder. Pus from lumbar caries may escape through the great sacro-sciatic notch to form a *gluteal abscess*; this may point by the lower border of the gluteus maximus. A child was recently seen in whom fistula-in-ano remained after an abscess had broken through the ischio-rectal fossa. Fistula-in-ano from spinal abscess is a rare condition, and apt to pass unrecognised. There is, however, a strange, suspicious look about the opening, and a probe may be passed through it up towards the spinal column.

An abscess near the spine is not necessarily the result of vertebral caries; if the spine bend freely, it certainly is not; but a large chronic abscess in the neck, trunk, or thigh, is very apt to be associated with vertebral caries.

The **diagnosis of caries** is easy enough when angular deformity has been produced; but the surgeon must detect it in those early days when a view of the vertebræ themselves could reveal little more than an hyperæmic or slightly inflamed area; it is then that treatment may effect greatest good.

Stiffness of the affected region of the spine is a sign of greater importance than angular deformity; from first to last in vertebral caries there may be no projection whatever of the spinous processes. In the mid-cervical or lumbar regions the occurrence of an angular projection is hardly to be expected, on account of the backward direction of the concavity of the normal curve. (*See Fig. 34.*)

Caries in the lumbar region is apt to have advanced much farther without recognition than it could have done in the neck or chest. In the last-named region a slight falling together of the bodies of the vertebræ is accompanied by so obvious a projection of

the spinous processes (which are by nature prominent) that the mother herself notices the back growing out.

The adjacent sketches show that a slight falling together of the front of the cervical or lumbar vertebræ must produce a straightening of that part of the column, and not a projection (Fig. 34, B and D). The normal projection of the seventh cervical spine has occasionally been mistaken for a sign of disease.

An early sign of spinal caries is *fatigue*, coming on during play as well as in lesson time. The boy does

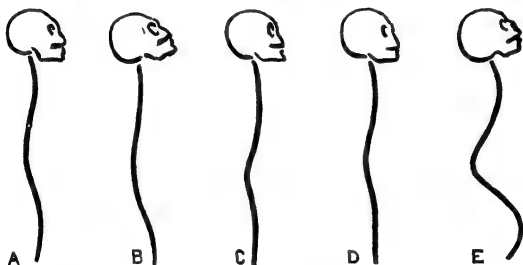


Fig. 34.—A, Normal Curves; B, Cervical Caries, neck stiff and straight, head thrown back; C and D, Lower Dorsal Caries, slight projection, otherwise back straight; E, Advanced Dorsal Caries, marked boss and secondary curvatures; extreme lordosis (saddle-back.)

not care to run about, but complains of feeling tired, and, leaving play, he lays himself down near his mother, or on the sofa or hearth-rug. When standing, he supports himself by holding his mother's dress, a chair, or table. He cries as he is taken out of his bath or is lifted from the floor, on account of the disturbance of the inflamed area. When standing, he props himself up by grasping his thighs above the knees.

"How does he come down stairs?" If the answer be that he now asks to be carried down, or prefers a leisurely and cautious descent, by the aid of the balusters, putting each foot on every stair, and refusing to jump from the bottom step; and if he complain

of pains along the sternum, or at the sides of the chest, down the arms, in the abdominal walls or thighs, the case is pretty clear. When sitting at meals or lessons he will lean forward, and support his chin in his hands, the elbows being planted on the table; and when standing also, he may steady the chin with the hand. He is apt to stumble as he runs or walks.

When spinal caries has existed for some years, the attitude and expression give evidence of the disease. The face is old and thoughtful beyond the years; the body and limbs are ill-developed; and, judging from size alone, one would be much misled as regards the real age of the little sufferer. Development is checked by long-continued disease; but intellect is often extremely bright, and the patient endurance remarkable. From his being constantly in the company of grown persons, and unable to join in any of the games of those of his own age, the manners of the child become quaint and matured. It may be said of many of the subjects of spinal caries that they have no childhood.

Pains.—If the disease be in the *cervical* region, there may be pains, possibly called “headache,” over the area of the occipital branches from the second cervical nerve; or in that of the great auricular from the second and third. A little girl suffered constant pain, darting over the region between the chin and the sternum, which she described as “belly-ache in the neck;” it arose from pressure on the transverse cervical nerves as they issued from the diseased region of the column. Little children are not clever at describing symptoms, and a headache “somewhere here” is apt to be the result of irritation of the trunks of high cervical nerves.

If the disease be lower in the neck, pain may be referred to the pectoral or deltoid regions, where the supraclavicular branches are distributed—from the third and fourth nerves.

If the lowest cervical vertebræ be inflamed, the trunks of nerves which enter into the brachial plexus will be liable to compression, pain being referred to shoulders, elbows, or even to the fingers. For pains in each shoulder or each arm, the cervical spine should straightway be examined. And even if obscure pains be not symmetrical, but confined to one side, attention should be directed to the spine. The theory of "growing pains" is not tenable.

When the *dorsal* vertebræ are diseased, neuralgia may be felt in the intercostal nerves, or their peripheral branches. And when any part of the lower half of the dorsal column is affected, pain may be referred to the epigastric or umbilical region, or even to the skin over the ilium, where the lateral cutaneous branch of the last dorsal nerve is distributed. Sometimes I have heard of a "tight" feeling around the trunk, and of "cramps" in the trunk and limbs.

With *lumbar* disease the pains are referred to the ilio-hypogastric and ilio-inguinal nerves, or the genito-crural or external cutaneous.

If, on being asked where the pain is, the child place the fingers in each groin, or over each hip or each iliac crest, it is almost certain that he has high lumbar caries. Pains in the front of the thighs, that is, over the region of the anterior crural or obturator nerves, should direct attention to the region of the third and fourth lumbar vertebræ. If it happen that the nerve-fibres destined for the long saphenous branch are irritated as they leave the column, pains will be referred to inner side of leg or foot, or ball of the great toe.

Unfortunately, radiating pains are often ascribed to rheumatism. Symmetrical pains are the result of central mischief, and generally of spinal disease. (Knee-pains may be caused by disease of the sacro-iliac joint, hip joint, knee joint, or by pelvic abscess.) (See page 350.)

In the **examination for suspected caries**, the child should be stripped quite naked, and if the weather be cold he should be taken to the hearth-rug. To examine the back under the shirt, or to strip him only to the waist, does not suffice for thorough inspection. To percuss, or apply a hot sponge along the



Fig. 35. — Early Dorsal Caries; child cannot bend the back in stooping; and supports weight by hand on knee.

spine is an inefficient and fallacious test, for a touch over even the soundest part is apt to cause apprehension, and, having set the child crying, to spoil the case for further examination on that occasion. Having inquired of the mother concerning the peripheral pains (page 255), and having taken a glance at the back, the range of movement in the column should be noted. For this purpose it is well to throw a pen, a coin, or a toy upon the floor, and watch the child pick it up. If he be frightened or obstinate, and

refuse to stoop, the end may generally be gained by letting his sock or shirt fall, and telling him to pick it up, so that he may be dressed and taken away. As a further test of stiffness, the child may be asked to bend his shoulders and trunk backwards, and then laterally.

If the *dorsal* or the *lumbar* vertebræ be affected, the spine is so rigidly fixed that the child cannot stoop; he will try to bring the hand to the ground by bending the hips and knees, keeping the spine quite stiff. If the *neck* be diseased, he cannot bend his face towards the floor. He will not be able to turn the head without wheeling round the shoulders, nor will he shake or nod it. Every movement is carried out with caution; the occiput is drawn back and steadied against sudden jars. Thus the neck is shortened, the shoulders being drawn up also, to steady the base of the skull. With advanced disease in the dorsal region, the cavity of the chest is diminished, and respiration is hurried and jerky.

If the child be stood upon a chair or footstool, and asked to get down, he will do so with extreme caution, dreading the least shake; he will certainly not be willing to jump down; not that it is advisable to propose so severe a test. The surgeon may stand in front of the child, and, whilst talking to him, gently press down upon the top of the head; or, in the case of suspected dorsal or lumbar disease, upon the shoulders. By watching the facial expression he can at once see if this pressure cause discomfort. A healthy child would support a great deal of pressure thus applied without a wince or change of feature.

Disease of the occipito-atloid joint.—From severe injury, or under the influence of wet, cold, or constitutional enfeeblement, inflammation may attack the synovial membrane of one or both of the condylar joints. A case was recently under treatment in the

person of an anxious-looking boy of four years, whose chief trouble was pain about the top of the neck and lower part of the head ; he had met with no particular injury ; he soon got tired, and was glad to lie down by his mother. He sat with his head in his hands, and on being asked where "it hurt," pointed behind

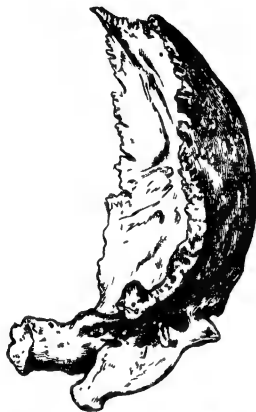


Fig. 36.—Synostosis of Atlas and Occiput the result of suboccipital disease.

the right mastoid process. The head was inclined towards the right side. In disease of the atlas the pain is usually confined to one side, because the inflammation (at first, at any rate) is limited to one lateral mass.

The adjoining figure, which is taken from a preparation without recorded history, shows recovery with synostosis after disease of the left condylar joint. Plastic deposit had also joined the left side of the posterior arch of the atlas with the occipital bone, for

extra strength and steadiness. The occipital bone had sunk backward into the characteristic position.

To obtain a result so favourable as that given above, cervical caries demands early diagnosis and immediate treatment ; unfortunately the first symptoms may be considered rheumatic.

Disease of the atlas and axis is a most serious condition, as the softening may extend to the odontoid process, or determine the rupture of the transverse ligament, with, consequently, compression of the medulla oblongata. Though the disease cannot be localised with absolute precision, it may be denoted

with sufficient accuracy. Thus, the child cannot nod or shake his head with those short, sharp movements which imply "yes" and "no," and he cannot bear any pressure on his head; there are pains and tenderness beneath the mastoid process, and pains in the area of distribution of the greater and lesser occipital, and of the great auricular nerves. By insisting on absolute rest in bed, a very small cushion being carefully laid in the nape of the neck, and a large sand-bag on either side of the head, the surgeon does his best towards promoting resolution or ankylosis.

Case.—A schoolboy of twelve, who was in other respects quite healthy, complained to the doctor who attended the school of pains in the neck; they grew worse under the treatment adopted. He was, therefore, taken home to be under the care of a physician, who also ascribed the pains, which radiated over the head and neck, to rheumatism. Lastly, a surgeon was called in and cervical caries diagnosed. The boy was then kept flat on his back, with large sand-bags along either side of his head and neck. But motor paralysis in the lower extremities occurred; and one night the diseased vertebræ gave way, immediate death being the result.

General signs of spinal abscess may be deep-seated, or peripheral neuralgic pains, which are not necessarily symmetrical in their distribution; there is a tenderness and fulness, as in the iliac fossa, and the surface veins are engorged; the limb may be œdematous from pressure of the pus upon venous and lymphatic trunks.

In every case of dorsal or lumbar caries, and particularly so when there are "rheumatic" pains or startings in the thigh and leg, the iliac fossa should be examined for on-coming abscess. The child should be naked, and lying with his thighs drawn up; steady pressure should be made with the fingers down into

the iliac fossa, beginning the examination on the sound side. Attention should always be distracted by beginning the examination in a part which is free from tenderness. If a child with probable lumbar disease affirm that "it hurts" when the skin of the pectoral region, for instance, is gently pinched, no confidence need be placed in his subsequent statements.

Spontaneous absorption of abscess may occur, but the happy event is rare. *Case:* Lilian G—, six years, came under treatment (in Nov., 1880) for dorsi-lumbar caries, for which she was kept lying down for nine months, during which time night-shriekings, and pains on movement, disappeared. She was, as her mother said, "ever so much better." A plaster of Paris jacket was applied, which she wore continuously, and with the greatest advantage, for five months, gaining five pounds in weight. The next she wore six months, but on its being taken off the child complained of pains in the area of distribution of many of the cutaneous branches of the right anterior crural nerve, and especially along the inner side of the ball of the great toe. Abscess was detected in the right iliac fossa. Another jacket was applied, which was worn continuously for fifteen and a half months; on its removal there was not a trace of abscess, the child was free of pain, quite well, and strong. She was ordered a stiff canvas jacket strengthened with strips of whalebone.

I have recorded this case chiefly as a clinical curiosity, and that I may take the occasion of saying that such a happy consummation is neither to be expected nor even hoped for. The parents should be made aware of the fact of the formation of an abscess (the surgeon being constantly on the look out for it), in order that they may the more fully appreciate the gravity of the case and the need for the thorough

rest in the horizontal position. It should be understood that these abscesses form, as a rule, very slowly, the sensory nerves in the neighbourhood gradually accommodating themselves to the altering pressure. There is, therefore, nothing to suggest that pus is collecting in the fossa except the deep-seated fulness. For very obvious reasons, it is better that the surgeon first notice this rather than the mother, the nurse, or the child.

The **constitutional treatment** consists in the use of cod-liver oil and steel wine ; if a child turn against the oil he had better not be forced to take it, probably the stomach cannot digest it ; a teaspoonful may be rubbed into the skin every day. The compound syrup of the phosphate of iron, quinine, rhubarb and soda, the laxative iron mixture, may be prescribed as occasions direct, but it may be well to leave the child now and then without medicine, or to give him daily a little maltine and cod-liver oil—“as a treat.”

The **diet** should be plain, nourishing, and easily digested, consisting for the most part of milk, with now and then some extra cream, milk-puddings, underdone or fat meat and gravy, fruit, and vegetables. The child should not be pampered, and care should be taken that the appetite is not cloyed with cakes or sweet-stuff. Neither wine nor beer is, as a rule, required ; but if exhaustion increase, a little may be of service.

The **mechanical treatment** of spinal caries is comprised in one word, *rest* ; and, speaking generally, this rest will be best obtained by keeping the child flat upon the back upon a firm and narrow horse-hair mattress, on which, in fine weather, he may be carried on a board into the garden, or on to a carefully arranged spinal carriage ; he should have a thin, firm pillow. He can be washed and dressed by being

turned first on one side, then on the other, without being disturbed; some violet powder may be dusted on the skin. All the clothes which he wears as he lies in bed should be open behind, so that nothing has to be slipped over his head as he is being dressed and undressed. The bed must be carefully made.

Unfortunately, such perfect rest is rarely obtained. Plaster of Paris jackets, and other forms of support,



Fig. 37.—Breast-plate and Collar for Cervical or High Dorsal Caries.

aim at securing rest whilst the patient goes about; but this is only the second-best line of treatment, for the "rest" is less perfect. A child does not fret or pine if he be kept constantly in the horizontal position. He will even like the treatment, when its adoption is the means of ridding him of his pain. After from six months' to a year's rest, if he have been going on well, relaxation in the

treatment may be gradually allowed.

I do not advocate the treatment of spinal disease, or of the peripheral or central pains due thereto, by blister, cauter, or other form of counter-irritation; rest is all-sufficient. And as soon as it is undertaken and carried out, thoroughly and efficiently, so soon does the child begin to improve as regards health, strength, and happiness.

In the **treatment of cervical caries** I have given the jury-mast of Dr. Sayre a fair and extensive trial, and have now entirely discarded it. It is heavy and cumbersome, and offers no advantage over the leather cervical collar (Fig. 37), which bears up the chin and occiput. The rotatory movement of the

neck, which the jury-mast is constructed to permit, is an absolute disadvantage; rest, and always rest, is the one indication for treatment.

The cervical collar gives relief by ensuring this rest, rather than by actually lifting the superimposed weight, as may be inferred from the fact that its influence is equally beneficial in *high dorsal caries*.

A child was frequently crying on account of pains in the chest; he had also the habit of putting his hand to his head, as if in pain; he was growing thin, and his mother had "no peace with him." The neck and shoulders were stiff from caries of or about the second, third, and fourth cervical vertebræ. On being fitted with the "collar" the pains ceased, and he grew fat. At the end of a year, though still wearing the support, he was in excellent condition.

The collar is made by Spratt, of New Bond Street; it is moulded on after the leather has been soaked in a pail of hot water; the hardened case is afterwards lined with chamois leather, and the front and back halves are made to overlap on the shoulders, and are fixed together by straps and buckles. The material is cow-hide which has not been "dressed"—that is, impregnated with oil.

Amongst the advantages of the collar are its lightness, its durability, its easy fit, and the security which it affords; which last is so great that it is not necessary to keep the child always in the horizontal position, though, of course, he must be kept in comparative rest and quiet; and, for the first few months, absolutely flat on his back.

Dr. Fleming has recently introduced an expanding bag of indiarubber, which is distended and worn around the neck. The scheme is excellent, but the support afforded by it is far less efficient than that obtained by the cervical collar. Moreover, the air gradually leaks out of the bag-like collar.

The treatment by weight-extension does not specially commend itself to me. But in every case of cervical or high dorsal caries, until the acute symptoms have passed away, the child should be kept lying supine and flat upon a mattress, with only a low pillow *under the nape of the neck*. The head should, further, be steadied between two large sand-bags, and neither by day nor night should he be allowed to raise himself from the horizontal posture. As regards the length of time, it is better that the treatment be carried out for too long than too short a time ; thus the risk of abscess and of deformity is diminished to the utmost. For the child of poor patients an excellent bed may be arranged in one of the long boxes in which oranges are usually imported. After many months of the horizontal position, all complaints of pain, "tightness," and discomforts generally, having long ceased, the child may be fitted with the cervical collar, and may then, under close supervision, be allowed to sit up in bed, or even to get about a little. If I may be allowed to say so, there is often a want of thoroughness in the treatment of spinal disease, early as well as late. And it is hardly necessary to remark that most of what has been detailed above applies equally to the treatment of spinal disease in other regions than that of the neck.

In a private family it is generally advisable to inaugurate the treatment under the superintendence of a professional nurse ; she need not stay longer than is necessary to get matters into perfect working order.

The treatment of dorsal and lumbar caries by absolute rest is not generally obtainable for all poor children. The next best treatment then consists in the use of plaster of Paris jackets, as systematised by Dr. Sayre, or of poroplastic felt corsets.

To prepare the rollers, crinoline muslin is torn into strips about five inches wide, and five or six

yards long. The sizing should be removed by soaking in hot water, so that, when the muslin is dried again, the gypsum may be more thoroughly rubbed into its meshes; the gypsum should be fresh, or should, at least, have been kept in a dry place.

A tight-fitting cinglet is drawn over the body, and a long thick pad run beneath it along each side of the spinous processes, to prevent chafing. No so-called "dinner pad" need be used, and the rollers should be applied closely and evenly around the trunk from just above the great trochanters to high up in the armpits. There is no necessity for suspension of the child whilst the jacket is being applied. It has been proved excellent practice to have the child standing, with the arms held up out of the way. Some prefer to apply the jacket in strips, as the patient is lying down. But as the jacket is not applied with the idea of straightening the spine, but merely for securing rest, the position adopted matters little. Davy prefers to have the child lying in a hammock during the application, the hammock being incorporated with the casing.

It is important that the bandages be quite loosely rolled, so that immediately they are put into water every molecule of the plaster may be straightway wetted. The roller is dipped, not soaked in the water, and should be applied dripping wet; squeezing it drier in the hand causes a loss of the gypsum, as well as of time. The addition of a little common salt to the water hastens the setting. The whole business of applying occupies but five or ten minutes, and a handful of moist sugar in the wash-hand basin will be found of excellent service in freeing the operator's fingers and nails of adhering plaster.

The plaster of Paris treatment is of equal service in the treatment of caries of the dorsal and lumbar region. When the jacket is on, the child must still be kept very quiet, and as much in the horizontal position as

possible, in order that the diseased bones may be in a position of continuous rest. We have had many children attending school in their jackets, after permission for them to lie during school hours had been obtained. They should not go to school both morning and afternoon; and Sunday should be to them a day of perfect rest.

By a little ingenuity the trunk can be washed without removing the jacket—as by briskly drawing up and down beneath the cinglet a napkin which has been damped and soaped. One great advantage of the gypsum treatment is that the jacket is never taken off by the nurse or mother, so that rest is continuous; another advantage is that it is cheap, and that it can be applied by the medical man without extraneous help. The poro-plastic jacket, serviceable as it is, cannot be fitted by every surgeon, and it possesses the disadvantage of being movable.

The **treatment of spinal abscess** is not a satisfactory affair; many a child begins slowly to sink when the abscess is interfered with. But when pus is causing constitutional irritation and distress by stretching sensory nerves, then the *noli me tangere* policy must be abandoned; and when pus is approaching the surface, and the skin is red, and about to undergo ulceration or sloughing, the abscess had better be opened by art than left to nature. Repeated tapping by the aspirator may be beneficial when the pus is thin, but my experience is that the scalpel has generally to supplement the aspirator. Still, if the pressure-symptoms be not urgent, the aspirator may be tried, the withdrawal of pus being repeated at intervals of a few days, so that the cavity has not the chance of re-filling. A single aspiration rarely suffices; repeated trials, however, may accomplish a permanent cure, but during the treatment the child must be kept absolutely at rest. After aspiration has proved inefficient, recourse can at

any time be had to incision and drainage. Tapping with the canula and trocar usually leads to disappointment, from pus leaking out by the wound and the abscess becoming septic.

A post-pharyngeal abscess must promptly be opened, lest, bursting of its own accord, the pus be drawn with a convulsive inspiration into the larynx, and the child be suffocated. I have never seen a post-pharyngeal abscess which was due to other disease than that of the vertebræ; it might occur, however, after acute fever, or in the course of an attack of pyæmia, independently of vertebral caries. There may, at first, be no aggravation in the symptoms of the cervical caries with the formation of abscess, but as the bulging of the pharynx increases, "sore throat" may be complained of, with difficulty in swallowing, and even in breathing. There may be also a bulging in the neck, most likely behind the angle of the jaw. Solids cannot pass through the narrow fauces, and if the bulging be great, even fluids may regurgitate. The child runs the risk of suffocation, both from obstruction caused by the swelling, and from the abscess suddenly discharging its contents into the larynx.

Ordinary inspection of the throat may not suffice to detect the abscess; the index finger must be introduced, and made to explore the back of the pharynx. If pus be there, a doughy swelling will be detected, or even definite fluctuation. In dealing with such an abscess the patient should be anæsthetised; when he is propped in the sitting posture, the head should be brought well forward, and, the mouth being fixed open by a gag, a free incision made into the bulging tumour with a guarded bistoury.

A post-pharyngeal abscess may be opened through the side of the neck; but if the tumour be prominent at the back of the pharynx, it had better be opened as briefly described above. If the skin at any part of the

neck be thinned from subjacent pressure, that spot may certainly be selected for evacuation of the abscess.

To open an abscess.—When the time has come that a spinal abscess has to be evacuated, the opening should be made in such a position that drainage can be efficiently maintained. If, for instance, the iliac fossa be filled with pus coming from lumbar caries, the abscess may be opened in the region of the quadratus lumborum, the child being kept subsequently on his back. Psoas abscess, too, instead of being attacked in the base of Scarpa's triangle, should be opened by the side of the lumbar spine. Nature, however, is frequently allowed to indicate the situation at which pus shall be induced to find escape, but in her choice she is guided by anatomical rather than surgical principles.

I have long recognised the importance of opening a spinal abscess with reference to the question of perfect drainage, choosing for the site for attacking a collection of pus in the sheath of the psoas a spot midway between the last rib and the iliac crest, at the outer border of the quadratus lumborum. Chavasse and Treves have strongly advocated this treatment, the advantages of which may be thus summarised:—The abscess is tapped, and the pus escapes at the most dependent point, and, as the patient lies on his back, the cavity drains itself without trouble or difficulty. The sinus having been thoroughly established, and the drainage tube admitted, accumulation is unlikely to take place. The opening is very near to the diseased bone, so that three or four inches of abscess cavity below this point at once begin to contract. The antiseptic dressings can be applied and retained in position more readily than if the drain were in the thigh, and they are less likely to be soiled by urine or fæces. It is well to make a primary opening near the anterior iliac spine, so that the drainage tube may be passed

through the length of the cavity, and irrigation more perfectly carried out. Indeed, unless the abscess be localised in the lumbar region, I generally attack the bulging iliac fossa front and back.

A short time since, when opening an abscess which filled the flank of a boy with angular curvature, on introducing my finger by the outer side of the quadratus lumborum I detected in the cavity several sequestra, which had been shed from the diseased vertebræ. The largest of them was, perhaps, of the size of a bean, others were of the size of a pea; they were quite loose in the space. The abscess was washed out with iodine water, and dressed with firm compresses of marine lint. The boy improved immensely after the evacuation of the abscess, and was eventually admitted into a home for cripples. His brother was under my care at the same time for large spinal abscess, which was dealt with in the same manner. In his abscess no sequestra were found.

As regards the exploration of the diseased vertebræ through the lumbar opening, the method is probably of no great importance, still I have often done it. Sometimes, on exploring, one finds the cords of the lumbar plexus stretching through the pus, which has effected the complete disappearance of the substance of the psoas; sometimes one can detect carious bone, or the diseased surface of the vertebræ covered with soft granulations; at other times all is anatomical darkness. At present, at any rate, the carious vertebræ are beyond the reach of active interference. The exploration is more a matter of interest than of clinical importance, though the opening of the abscess from the loin marks a real advance in the surgery of spinal caries. Care must be taken in no way to injure the neighbouring layer of peritoneum.

On rare occasions it has happened that a hernia of bowel has followed in the track of an extinct spinal

abscess after the skin-wound had soundly healed, and that the tumour has been opened in mistake for a recurrence of abscess. A lumbar hernia would probably be resonant on percussion, and entirely reducible. (See *Brit. Med. Journal*, May 5, 1888.)

Complications of spinal caries may come on with or without the formation of abscess. First among them may be mentioned *paralysis*, from pressure upon the cord, either of inflammatory thickening, or of the bodies of the vertebræ themselves. The front of the cord being pressed upon, paralysis only as regards motion results. The more quickly the curvature advances, the greater the risk of paralysis, as the parts have not time to adapt themselves to the altered conditions. Paraplegia is usually met with in those cases in which no abscess has formed.

This paralysis may be of therapeutic value, as the child has to lie flat and quiet, during which time the bones obtain needful rest. The power of movement may return. A patient with high dorsal caries was paraplegic on one occasion for fifteen months, but the trouble passed away entirely. Another child was recovering from a second attack of paraplegia when the last record of his case was made. Sensation not being affected, the skin remains well nourished, and bed sores are of rare occurrence. Control over the bladder is preserved. Patients are lost from tubercular meningitis even when the spinal trouble seemed to be going on well. Others have died from pyæmia, bronchitis, or some intercurrent disease, such as measles or whooping cough, to which, from his enfeebled condition, the child proves a ready victim. The commonest cause of death is the exhaustion which is associated with the chronic discharge from the abscesses; the liver may grow large and hard from amyloid disease, and the urine become loaded with albumen. Fatal hæmorrhage may occur from the

abscess opening the aorta, the vertebral, or iliac artery.

Not unfrequently it happens in feeble subjects that the child with spinal caries becomes the subject of chronic suppurative disease in a hip, knee, ankle, or wrist; and if this complication prove intractable, I am sure that it is inadvisable to keep on temporising. The child might successfully struggle against one trouble, but under the two he will probably succumb. Amputation affords him the best prospect of complete recovery; excision is, of course, out of the question in his state of health. As soon as the diseased limb is amputated the spinal trouble may make a start towards recovery.

Conclusions.—It is impractical to look forward to the spontaneous absorption of a psoas abscess; sooner or later it must be evacuated by nature or art. In this matter art has the advantage, as by her aid the cavity can be at once emptied, cleansed, and drained. The earlier the abscess is opened, the better; for delay may entail the extravasation of pus, and the formation of a needlessly large and intractable cavity. The abscess should be opened and irrigated from the front and drained through a counter-opening in the loin. Washings and drainage should be thorough. For a small abscess which is bulging posteriorly, the single opening at the back may suffice.

Warm iodine-water (decolorised by the addition of a little carbolic lotion) is the most suitable fluid for irrigation; the sublimate solution of 1 in 2,000 is dangerous. The most convenient dressings are bulky pads of wood-wool, and gauze bags of finely-picked oakum, fixed under a towel tightly pinned as a binder. Pus may rapidly collect on the opposite side of the spine, after a single abscess on the one side has been evacuated; therefore, if the temperature rise and remain high after the evacuation of a unilateral abscess,

the formation of a second abscess should be watched for, and it should be opened as soon as it is detected; thus convalescence may be at once established.

Bilateral abscesses should be attacked simultaneously; they are likely to be in intercommunication, and the area of suppuration cannot be kept aseptic unless both sides are washed and drained.

A certain amount of deformity must be expected to follow even the successful treatment of spinal caries; in some cases the amount of deformity is insignificant, especially where the treatment has been begun early and carried out thoroughly. Sometimes the resulting deformity is an abnormal straightness, as in the neck or loins; sometimes, as in the dorsal region, it is angular. By "cure," one means a falling together and consolidation of the diseased bodies. If a projection have been formed along the backbone, no treatment can obliterate it. Suspension may diminish the unsightliness of secondary curves, but the primary curve must be permanent.

I have not a word to say in favour of trephining, or of any other cutting operation undertaken with the idea of relieving the motor paraplegia which follows spinal caries.

Acute cervical abscess, with or without spinal caries, must be opened as soon as diagnosed, for the relief of the tension of sensory nerves, and to obviate the risk of serious extravasation. Such an abscess should be opened after Hilton's method, even before fluctuation is manifest or the skin reddened. An exploration can do no harm; the uncertainty must be set at rest, and pressure relieved. The skin of the neck should be washed, and an incision of half an inch or more should be made along a border of the sterno-mastoid, any superficial vein being avoided. Then, with a steel director, a puncture is made in the deep fascia, and the fulness reached by scratching and

gently tearing with the director ; pus will at last flow along the groove. Then the end of a pair of ring dressing-forceps is thrust along the groove and into the cavity, the blades are opened, and so withdrawn. A free opening being thus made, and pus having escaped, the nozzle of an irrigator or syringe is introduced, and the cavity distended with hot water, to which tincture of iodine has been added, sufficient to give it a definite yellow tinge. All cheesy matter, sloughs of fibrous tissue, and *débris*, having been thoroughly washed out, a full-sized drainage tube is inserted, and the opening packed around with mercuric wool and carbolised tow, the abscess walls being compressed with oakum pads and bandage.

Cervical abscess may be secondary to caries of the temporal bone, the pus finding its way along the posterior belly of the digastric (page 224).

CHAPTER XX

THE GENITO-URINARY TRACT.

IN the process of development, a hollow growth, like the finger of a glove, starts from the hinder end of the foetal intestine, and, extending upwards and forwards, leaves the abdomen by a wide gap in the anterior wall. This is the allantois. Its pedicle is subsequently dilated into the bladder, whilst the upper part of the tube, continued through the umbilicus, is the urachus. Then a partition grows downwards to convert the existing cloaca into two passages, the urethra and the rectum. Thus at birth the fusiform bladder is an abdominal rather than a pelvic viscus.

In rare instances the obliteration of the urachus may be delayed, so that urine, and even vesical calculi, have passed through the umbilicus of the young child.

For the treatment of urinary fistula at the umbilicus, the urethral canal should be explored by the passage of a fine catheter ; and, if necessary, the water should

be drawn off at regular intervals, so as to give the abnormal opening the chance of closing. If cicatrization were delayed, the aperture might be touched with the benzoline cautery. But the treatment of the fistula would be a secondary matter should there be a calculus or a phimosis.



Fig. 38. — Development of Bladder from hinder End of Alimentary Canal; Continuation of Bladder through Umbilicus.

Small vascular polypi

may grow in the depths of the umbilical cicatrix. From microscopic appearance, they probably take their origin from the surface of the urachus, which granulates after the attached end of the umbilical cord has fallen. At

times no larger than a pin's head, they may attain the size of a currant or plum ; they are bright red, bleed at the slightest touch, and are associated with the escape of so much irritating secretion, that the skin for some distance around the navel may be eczematous. They may be removed by a snip of the scissors, or their pedunculated base may be tied with a fine waxed ligature. Occasionally they are so deeply placed in the cicatrix that the walls of the depression must be held widely apart by dressing-forceps before they can be dealt with. In every case of eczema at the umbilicus a careful search should be made in the cicatricial folds of the navel. Occasionally these polypi are associated with urachal fistula.

Fæcal fistula at the umbilicus is another cause of eczema; it may be the result of prolapsed intestine having been included in the ligature of the umbilical cord, in which case evidence would be afforded within a few days of birth (page 279); or of the rupture of a strangulated umbilical hernia (page 280). A more frequent cause of the fæcal fistula is ulceration of the bowel, after inflammatory adhesions have attached it to the abdominal wall. The ulceration may be of tubercular origin, or may be started by a local peritonitis, but in each case adhesive peritonitis guards the general serous cavity against the entrance of the irritating fluids. A large abscess may precede the establishment of the fistula. The piece of intestine implicated is often the transverse colon; on the administration of a rectal injection, some of the fluid is then found escaping by the fistula.

Another cause of fæcal discharge at the umbilicus is the section with the cord of a pervious *Meckel's diverticulum*, a duct which, early in foetal life, led from the lower end of the ileum to the interior of the umbilical vesicle, and which should, long before birth, have dwindled away. In connection with this subject it may here be remarked that the diverticulum, though not pervious to the umbilicus, often exists as a fibrous cord, beneath or around which a piece of bowel may become strangulated.

In the case of fæcal fistula occurring within a few days of birth, the opening is solitary; but when the discharge is secondary to the formation of abscess, there may be several superficial cloacæ associated with a single opening into the bowel.

The subjects of fæcal fistula are generally pale and ill-nourished; they must be kept at rest. The diet should be light; cod-liver oil and iron may be prescribed, and the oil may also be used as an inunction. When the general condition is improving, attention may

be directed more definitely to the fistula, but no partial operation or cauterisation is likely to succeed. The bowels should be cleared by repeated doses of rhubarb and soda, and afterwards should be kept in absolute rest for ten days or a fortnight by a course of opium in minute doses ; the sore being left untouched under a thick dressing of vaseline and iodoform.

At the outset of treatment, provided the general health of the child be tolerably satisfactory, all fistulous tracks should be laid open and traced to a single aperture in the aponeurosis of the external oblique. Undermined or unhealthy skin should be cut away, and chronic granulation tissue scraped and freshened. Thus a large wound may be left, in the middle of which is the opening into the bowel ; this hardly suggests any active surgical interference, though a gentle scraping of its borders may serve.

After the tissues have been cleansed and scraped, it may be expedient, in certain cases, to leave a fair-sized drainage tube, communicating with the interior of the bowel, chiefly with the object of stimulating the periphery of the deepest part of the aperture.

If the case persistently defy this treatment, it may be deemed expedient to detach the adherent bowel, vivify and suture the edges of the aperture with fine catgut, and, dropping the intestinal loop into the peritoneal cavity, to close the abdominal wound.

Suppuration at the umbilicus may be due to the presence of an umbilical polypus (page 274), or to some other source of local irritation. The depths of the cicatrix should be thoroughly explored under chloroform before any treatment is adopted.

Hæmorrhage from the umbilicus* may be observed within the first ten days of birth ; it may entail fatal exhaustion. The blood may ooze up from the depths of the umbilical depression without there

* See also "Year-Book of Treatment," 1885.

being any apparent opening in the skin ; or it may well up in large quantities, soaking through compresses and bandages, and causing early death. It may even spurt out when the infant cries, and yet no opening be distinguishable. The later its appearance, the worse the prognosis. The *pathology* of the condition is not clear ; but as some of the subjects have lost blood from the rectum, penis, or gums, it is probable that umbilical hæmorrhage may be an indication of hæmophilia.

In the *British Medical Journal* of November 8th, 1884, Mr. T. F. Raven records a fatal case of umbilical hæmorrhage. Soon after the hæmorrhage began, Mr. Raven satisfied himself that the child was a true "bleeder" by making a slight scratch on the arm, and finding that the scratch bled for seven hours. This report confirms the belief that the condition is but an expression of the hæmorrhagic diathesis (page 58).

Treatment.—The effect of gentle pressure between the finger and thumb may be tried, and, if that fail, powdered matico may be applied, and a pad of amadou may be firmly bandaged on, the infant being kept absolutely quiet. Minute doses of iron and of ergot, or of Ruspini's styptic, may be administered, but no operative procedure—either by cautery, needles, or scalpel—should be attempted, for, though it may possibly succeed, it is more likely to fail, in which case the trouble is immensely increased.

A case of **thrombosis of umbilical vein**, with diffuse peritonitis, is described by Lewis Smith.* The fatal peritonitis was associated with the oozing of pus from the umbilicus. It might be due to pyæmia, the septic peritonitis following the use of surgically unclean scissors in the division of the cord.

Infantile peritonitis may be idiopathic, or it may be secondary to an inflammation which has

* *American Journal of Obstetrics*, May, 1884.

followed the ligature or separation of the umbilical cord. Peritonitis may run its course even in foetal life, and may end fatally. In 186 cases of peritonitis in children, 102 occurred within the first fortnight, 63 in the third and fourth weeks, and 15 of the children were over a month old.* Later on in child-life the disease is of rare occurrence, but it may be secondary to internal strangulation, pyæmia, or injury. Two children have recently been under treatment for peritonitis from this last-named cause. In one the inflammation followed a fall into a brick kiln, and was associated with rupture of kidney; in the other it was caused by a blow. The former patient recovered under the influence of a restricted diet, leeches, and opium; the other was the subject of local suppuration and of obstinate fæcal fistulæ.

Intra-uterine peritonitis may set up so much thickening and adhesion of the bowel as to cause complete intestinal obstruction. In a case of this nature the formation of an artificial anus in the ileum gave marked temporary relief, though it did not avert a fatal result (*Brit. Med. Journal*, 1885; p. 1201).

Multiple abscesses and other signs of pyæmia occurring in the first few weeks of infancy are likely to be the result of the absorption of septic material at the umbilical scar. (*See page 8.*)

Umbilical hernia.—Early in the process of development the abdominal cavity is wide open in front; gradually do its lateral walls come forward to join along the middle line. The part which is the last to be shut in is at the umbilicus, where the vessels to and from the placenta make their transit. It frequently happens that at, and for some weeks after birth, the umbilical aperture persists, covered in only by skin, superficial fascia, and peritoneum. In such a condition, a piece of intestine is apt to make

* Ziemssen's "Cyclopædia," vol. viii.

its escape from the abdominal cavity; and it has happened that such truant bowel has been tied or cut with the umbilical cord into which it was protruding. Possibly an officious nurse may commit the damage by cutting shorter the stump of the umbilical cord, which the medical attendant has purposely left longer than usual; she should, therefore, be cautioned in such a case. Though most, if not all, of these herniæ would gradually disappear into the abdominal cavity if left quite alone, still judicious treatment will advance the natural process of obliteration of the aperture. A penny-piece wrapped in linen, and fixed by strapping perfectly flat over the ring, answers well; no conical pad should be allowed, as this would retard the oblitative process. All straining efforts on the part of the patient should be checked (page 364).

If the umbilical cord of the new-born infant be found unusually bulky, the medical attendant should examine the root of it with finger and thumb, to see if it contains prolapsed bowel. If it do, he should thoroughly squeeze the knuckle into the abdominal cavity, and then tie the cord close against the surface of the body. In this way obliteration of the hernial sac is promptly and effectually obtained, and the hernia cured.

It were superfluous to speak of active surgical interference in the case of the reducible umbilical hernia of infancy. The natural tendency is to cure; the surgeon has only to aid nature in the completion of the developmental process.

A case of a bulky umbilical hernia in an infant three days old is recorded by Jordan Lloyd;* the tumour was so large that there did not appear to be room in the abdominal cavity for all of its contents; it looked ready to burst. Some of the bowel was returned into the abdomen, and a pad of dry lint was

* Birmingham Hospital Reports, 1884.

fixed by strapping over the remainder. This application was uninterfered with for five weeks, at the end of which time the tumour was of insignificant size. Lloyd rightly urges expectancy in all these cases. The abdominal cavity is increased in size after birth, and so the anatomical insufficiency is gradually effaced.

Adventitious umbilical hernia is that protrusion which appears soon after birth, and is not congenital ; within the first year the umbilical opening is still the weakest part of the linea alba. Later on, the cicatrix becomes firm and resisting, so that umbilical hernia in the adult very rarely passes through it.

Strangulated umbilical hernia would be accompanied by constant sickness, possibly of a fæcal nature, and extreme collapse ; unless the strangulation were relieved, the child would die exhausted—unless, indeed, relief came by gangrene of the bowel and abscess. Adhesive peritonitis might prevent the extravasation of fæces into the abdominal cavity, the case ending as fæcal fistula.

Before the abscess broke, there would be a dusky, doughy tumour at the umbilicus, and possibly some emphysematous crackling from escape of gas into the connective tissue.

Operation for strangulated umbilical hernia would be needed if the judicious employment of manipulation failed to afford relief ; but the cutting operation would not be needed immediately on the occurrence of symptoms. An incision should be made over the tumour ; the sac should be dissected away and the aperture closed by deep suture.

But if the bowel appeared of a suspiciously dusky colour, an artificial anus should be established, and the case subsequently dealt with as a fæcal fistula.

Fissura abdominalis.—When the abdominal walls fail to meet along the middle line, the visceral

cavity being closed in only by thin membranes, all the coils of intestine may protrude, as in early foetal life, from xiphoid cartilage to pubes, being clearly visible through the transparent covering. There are various degrees of this deformity; all that one can do is carefully to protect the mucoid film which covers the viscera, and await the more complete development, or an early decease.

Hiatus, or extroversion of the bladder, may be found in the male or female; the deformity is not incompatible with a long and useful life. Women affected with it have borne children; but as in man the condition co-exists with a urethra which is represented only by a groove upon the dorsal aspect of a rudimentary penis, fecundation would be scarcely possible. As Holmes remarks, there is no malposition of the bladder, as the term extroversion would imply, but the viscus is wide open on account of absence of its anterior wall, and the abdominal parietes having failed to meet. The umbilicus is very imperfectly developed; the pubic symphysis is absent, and the urine, as it trickles from the openings of the ureters, flows over the skin of the thighs and causes eczema or ulceration. Being coated by the mucous membrane of the bladder, the protrusion is soft and bright red. (Plate III. Fig. 2.) The part of the bladder seen is the postero-inferior wall, pushed forward by the bowels.

Treatment.—However well urinals may be adjusted, they are sure to chafe; for children their use is impracticable. As regards operative procedures, the ureters have been laid into the rectum, with the idea of converting that piece of the bowel into an urinary reservoir. The objections to this practice are that the recto-vesical pouch of peritoneum is likely to be wounded and a fatal peritonitis to ensue; that, should the patient survive the operation, he will be troubled by constant diarrhœa; and that, as the

operation wound contracts, the flow of urine into the bowel will be so seriously obstructed as to determine the occurrence of renal abscess.

Disappointment is apt to follow plastic operations : peritonitis, pyæmia, or exhaustion may bring on a fatal result, or the flaps of skin which have been raised and adjusted may slough, or be torn asunder in an attack of vomiting. Whatever be the procedure, too much should not be attempted on any one occasion ; if only the bladder can be covered in, the gain will be very great, as some apparatus can then be arranged for keeping the clothing dry and the surface of the abdomen and thighs comfortable. The epispadias can be dealt with subsequently. As regards the age at which the operation should be undertaken, no definite rule can be laid down ; if the child be healthy at four years, there may be no reason why it should not be done then. In some cases it may be advisable to turn the dissected flap with the skin surface towards the bladder, in others the raw surface. In the former instance, should the operation prove a success, no serious inconvenience need be anticipated from the subsequent growth of hair against the tender coating of the bladder. If the operation have been done in childhood, the continual wetting of the epidermal surface by the urine will have rendered it more like a soft mucous membrane, and unfit for the production of hair. In dissecting up the scrotal flap, care must be taken that a hernial sac, which in such cases is often present, be not interfered with.

Mr. Rushton Parker has lately obtained excellent results by the use of boracic acid as a dressing after an ingenious plastic operation. With boracic acid, decomposition is prevented and urinary infiltration rendered innocuous. During the course of the treatment the patient lay in a bath which was so constructed that the hips were continuously immersed

in warm boracic lotion, the trunk and limbs remaining dry.

In all plastic operations for the closure of the hiatus it must be remembered that the integuments of the abdomen are thin, and that a little reckless dissection might involve the peritoneal cavity. Whenever possible, the tissues of the scrotum should be employed for bridging over the exposed membrane ; it is often redundant, and is generally tolerant of surgical interference. The best result attainable in any case may be that the patient will be able the better to catch the dribbling urine in a well-fitting indiarubber reservoir. In consequence of the constant irritation at the opening of the ureters, and, secondarily, of impairment of proper working of the kidney, suppurative or cystic nephritis may cause the failure of the most carefully-planned operation, and sooner or later entail the death of the unfortunate subject of the defect. These remarks apply also to other instances in which the normal outflow of the urine has been hindered.

Epispadias is associated with hiatus of the bladder, when, the pubes being absent, the urethra is represented merely by a groove along the dorsum of the penis. It may exist without malformation of the bladder. The attempt to cover over the groove by means of skin flaps which are brought up from the sides of the penis, or by horse-shoe flaps from the scrotum, is not likely to give complete satisfaction, and operations performed upon each side of the bony pelvis with the view of diminishing the anterior cleft do not commend themselves.

Hypospadias is much more common ; in it the urethra is open along the under aspect of the penis. It is due to arrest of development in the process by which the margins of the urethral groove, which begin at the uro-genital sinus, come over to join in the middle

line. As the fusion of these lips takes place from perinæum, through scrotum to glans, the floor of the urethra is more frequently found deficient towards the glans. In the commonest form of hypospadias, the floor of the urethra is deficient in the glandular part of the penis, the defect being associated with a redundant, hooded prepuce upon the dorsal aspect. To bring the glans penis through a transverse incision in this hood, and, having turned the under part back, to use it as the material for a urethral floor, are, briefly, the steps of the plastic operation which might avail. Experience suggests, however, that this slight malformation had best be left alone; but it may be necessary to stretch and keep dilated the small slit-like or pin-hole orifice of the urethral passage. Sometimes the urethra opens on to the surface of the perinæum, in the front of the scrotum, or just behind the glans; in these cases the aperture may require dilatation, but a plastic operation, with the view of carrying on the urethra to the end of the glans, should not be undertaken. The plan of boring the glans with a red-hot wire, to establish a conduit in the proper position, has probably failed as often as it has been tried. Sometimes the meatus urinarius is closed at birth by a membrane which requires perforation. If, with an orifice in front of or behind the scrotum, the urethra be found to extend to the meatus, and to be blocked there by the membrane (*atresia urethræ*), the normal meatus may be opened up, and the abnormal aperture closed by a plastic operation. (See page 295.)

If, as a congenital defect, the under surface of the penis be adherent to the front of the scrotum, the connecting integument and fibrous tissue may be removed by lateral incisions, and the edges of the scrotal wound brought together by fine sutures. It is much better that all operations of this sort be done in childhood, before school-life is begun, and before that time when

operation is doubly dreaded on account of the apprehension with which its performance is associated. To advise that an operation be "put off until he is older," may be to cloud the brightest part of a boy's life, and to render him shy and unhappy.

Phimosis.—The preputial fold of muco-cutaneous tissue may be so redundant as to permanently conceal the glans penis, and, by its tight embrace, prevent the proper development of the glans; it may cause the glans to become corrugated and misshapen. The preputial orifice may be so small as to obstruct micturition, or to completely prevent it. In the newborn infant the prepuce is naturally large, out of proportion to the size of the penis, and at that time definite adhesions exist between the glans and its covering. But although no surgical interference be adopted, the glans may be expected to advance and likewise the prepuce to retire. Dr. Champneys observes that during foetal life the mucous layer of the prepuce is always blended with the glans, and that with approaching birth the adhesion melts away. Adherence of the prepuce after birth is, thus, the result of arrested development. To draw back the foreskin is extremely advisable, lest the lingering adhesions undergo further thickening. A slight permanent adhesion may cause much discomfort even in cradle life, and later on it may suffice to render the boy irritable and unmanageable.

If the prepuce cannot be completely retracted, the smegma cannot be cleaned from behind the glans, and, undergoing decomposition, it sets up inflammation. One may often feel and see the hardened cakes of smegma through the translucent prepuce; the imperfect cleanliness may cause suppuration beneath the prepuce. Small calculi, which have been passed from the urethra, may be found beneath the redundant covering.

The nurse should be instructed to draw the prepuce

back, and gently to wash beneath it when the child has his bath. If this cannot be done without giving pain, surgical attention is necessary. Many an infant is allowed to suffer irritation in this respect from false modesty on the part of the mother or nurse. If in the cradle, or when on the nurse's knees, the infant pull at the prepuce, an examination should be made. Sometimes there is adherence near the corona, which has rendered the removal of some of the secretion impossible. It will then suffice to tear the prepuce back beyond the corona, or to scratch through the adhesion with a director. If the prepuce, though long, be not tight around the glans, its orifice only being constricted, dilatation with the blades of the ring dressing-forceps may suffice; but rather than repeat this operation indefinitely, it is better at once to remove the end of the prepuce. I am a strong advocate for the operation of circumcision whenever there is any difficulty in uncovering the glans, or when, after having retracted the prepuce, there is difficulty in getting it forward.

The daily drawing to and fro of a prepuce which is swollen and tender, on account of the forcible dilatation to which it has been subjected, is likely to distress the child, and to be objected to by the mother and the nurse. And I would maintain that, except for slight cases, the old-fashioned operation of circumcision, if properly performed, leaves nothing to be desired. Once done, the trouble is at an end; whereas the "dilated" prepuce must be watched, lest contraction recur. The treatment of phimosis without circumcising is, on the whole, an undesirable practice. A long prepuce may cause such constant peripheral irritation as to direct unwholesome attention to the part, and engender, if not suggest, a habit over which one would be glad to have passed in silence; a practice which obtains, as I have been

informed, less amongst the circumcised than amongst other boys.

As regards the treatment of *masturbation*, all irritating applications, which produce soreness of the parts, are apt to lead to an aggravation of the disease. I believe that the best course to adopt is to take the boy aside and to talk to him kindly and quietly, explaining that unless he breaks himself from the practice a physical ruin may be awaiting him ; but if he be not old or sensible enough to profit by such advice, he must be carefully watched, and, if thought expedient, his hands might be tied behind him. Cantlie has written an excellent little essay on the subject, in which he alludes to the case of a boy of four years who was suffering from a guileless indulgence in the habit. An inspection of the parts should be made to see that there is no source of accidental peripheral irritation, such as a long or partially adherent prepuce, retained smegma, or chronic eczema. Inquiry should also be made as to the presence of any rectal irritation.

If there be the slightest indication, the boy should be circumcised ; or his bladder may be searched from time to time for a possible calculus. The sounding may be undertaken without an anæsthetic, provided it be done with care and delicacy ; and the boy should understand that it may be repeated from time to time should occasion demand it. It is well that some punishment be held *in terrorem*. In the case of girls, great cleanliness of the parts must be ensured.

The drugs which may be of service are iron, quinine, bromide of potassium, and small and frequently repeated doses of sulphate of magnesia. The child should not be allowed to eat for some hours before going to bed, and he should be got up early in the morning. The bed-clothing should be light, and the mattress hard.

Probably the baneful effect of the practice has been considerably exaggerated. In reviewing the question, Sir James Paget * remarks that when practised frequently by the very young, that is, at any time before or at the beginning of puberty, masturbation is quite likely to produce exhaustion and nervousness, and that these mischiefs are nearly sure to happen if the excesses be practised by those who are liable to epilepsy, or any other form of nervous disease. Mr. Lawson Tait writes: "I have always found the chief difficulty to be that of persuading those who have charge of schools that the practice was a physical delinquency rather than a moral evil; and that the best remedy was, not to tell the poor children that they were damning their souls, but to tell them that they might seriously hurt their bodies, and to explain to them the nature and purport of the functions they were abusing." Lucas attributes the association of flat feet and weak ankles, together with albuminuria coming on at about puberty, to the effects of the peripheral excitement.

Balanitis is an inflammation of the glans penis and prepuce. Its common cause is phimosis. There may be profuse purulent discharge, which, escaping through the preputial orifice, makes the case look like one of gonorrhœa, with which, indeed, it may be associated. It may be the result of an injury. The sooner that circumcision is done, the better; one should not wait until discharge has been diminished by the use of lotions beneath the tight prepuce, for the presence of the tight prepuce is keeping up the trouble.

Circumcision might, with advantage, be performed more frequently in early childhood. The removal of a long or tight prepuce may be the means of sparing the subject much unnecessary annoyance. The operation is a small matter in infancy, but its importance increases with youth and manhood, and

* "Clinical Lectures," p. 291. 2nd edit.

especially when it is performed for paraphimosis, balanitis, or verrucæ; more serious still is the operation when, from subpreputial irritation, intractable eczema, or epithelioma has supervened. Frequently I have heard a grown patient, whose case calls for the operation, say with reproach that the operation should have been done in his infancy. And it may be undertaken even before "the eighth day."

Before the operation of circumcision the surgeon should satisfy himself that the subject is in a good state of health, otherwise extensive inflammation and abscess may supervene.

Care should be taken that all instruments used during the operation are absolutely clean, and that the surroundings of the patient after the operation are of a satisfactory hygienic condition. I have known two children in one family die of blood-poisoning after circumcision performed by a careful surgeon; it was afterwards discovered that the soil-pipe was leaking into the wall of the bedroom. From lack of cleanliness in the instruments, syphilis has been inoculated in the performance of the rite, an indurated sore appearing in due course in the preputial stump. And from causes which might, or might not, have been eliminated, erysipelas, tuberculosis, buboes, and pyæmia have followed the operation. When it is decided that the operation is necessary, no half-measure should be adopted.

The following is the best way of operating, and for the great reason—that it is bloodless. The patient, under the influence of an anæsthetic, and lying upon a pillow with a thick towel folded beneath the pelvis, should be placed in a good light. The bed is not a convenient place for operating; a dressing-table or the top of a low chest of drawers is much better. Having squeezed the blood out of the organ by gentle compression between the fingers, a small elastic ring,

doubled if necessary, and tight enough to control the circulation, is slipped down to the root of the penis. Then, lest the glans be injured, the prepuce is to be drawn forward and held between the blades of the ring dressing-forceps, and the redundant skin cut off by a large pair of scissors. The mucous membrane, which is closely covering, or perhaps adherent to, the

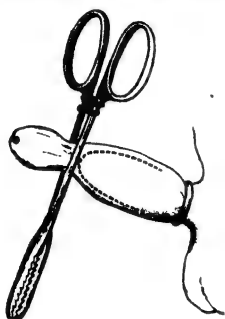


Fig. 39. — Arrangement for Bloodless Circumcision, an elastic ring encircles the root of the penis.

glans, is not implicated in this cut; so that, to complete the operation, it will be necessary to tear it up along the dorsal aspect by the nails, or by two pair of dissecting forceps. All adhesions between the mucous membrane and the glans must be torn through, and the membrane must be thoroughly reflected, but it is rarely necessary to remove any of it. It should be turned back and stitched to the skin-wound by four or six sutures of fine carbolised gut; if one of these

sutures be passed deeply through the frænum the risk of bleeding will be still further diminished, for it is from this fold of membrane that bleeding is most likely to occur. A little antiseptic wool or a strip of lint may be lightly wound round the end of the penis, and, last of all, the indiarubber band is to be divided by a snip of the scissors; this must not be forgotten. The only bleeding that can take place occurs when the band is cut, and, as a rule, it merely suffices to cause the dressing to adhere to the wound. If no bed-cradle be at hand for keeping off pressure of the bed-clothes, an ordinary willow-shaving hat-box will be found to answer the purpose when the bottom has been knocked out, the remainder being made to

encircle the patient's pelvis. If the child be unable to pass water in the usual way, he will probably succeed in micturating if made to sit in a basin of warm water.

Perhaps I may be allowed to remark that the simple operation of circumcision is often very badly done; sometimes far too little of the prepuce is taken away, and the operation has to be repeated, much to the annoyance of all concerned. Then not enough care is paid in breaking down every adhesion to the glans, so that the prepuce can be perfectly drawn back; unless this be done all the smegma cannot be cleared away; thus irritation continues, and a supplementary operation is needed. Every particle of smegma should be removed.

If the skin be drawn forward too freely before its removal, an unnecessarily wide zone of penis will be flayed; and though this will be covered again when the mucous membrane is turned back and sutured, there will in after-life be no trace of a prepuce.

Some surgeons advise that the operation be done under the influence of cocaine: for the adult this answers well, but for children it is far better to give chloroform. Children are apt to be frightened by the restraint, by the sight of an instrument or of a little blood, and before the operation is well begun they may be terrified and struggling to be free.

Those who are in the habit of performing circumcision as a rite do not suture the mucous membrane to the skin; and though the wound is washed over at the time with an astringent and antiseptic solution (wine), the operation is at times followed by serious bleeding. The insertion of sutures saves all risks of hæmorrhage, and ensures a rapid union of the approximated surfaces; being of soluble material the sutures may be left to dissolve. A surgeon who has very often performed the operation, both as a rite,

and in the ordinary way of practice, tells me that though sutures may not be necessary for an infant of eight days, he prefers to use them after every circumcision in older children.

To take away but a small piece of the prepuce is almost sure to involve so much subsequent contraction that the condition obtained is anything but an improvement; I have often seen a hard cicatricial ring where previously there was soft skin. Parents are, in such a case, much disinclined to subject the unfortunate child to a second but necessary operation. It is said that the cicatricial ring is likely to occur in a child who is the subject of congenital syphilis; if there were any suspicion on that score, it would be well to put him on a mild course of mercury (page 84).

The plan of passing a director beneath the dorsal part of the foreskin, and then slitting it up with a bistoury, is highly inadvisable. Though the effect obtained is secured in a quick and simple manner, the result as regards appearance is highly unsatisfactory; the large lateral flaps hang down and, infiltrated with serum, form an unsightly mass. The condition would no doubt gradually improve, but in the meanwhile the parents may be found expressing their dissatisfaction at the result; and I have heard of instances in which it was thought better that the boys should not be sent back to school until the peculiarity had become less conspicuous. To show that this style of operating (one cannot term it *circumcising*) is also a dangerous one, I will quote an instance in which the surgeon had the misfortune to introduce one blade of the scissors into the urethra, and so divided the dorsal part of the glans penis as well as the foreskin.

As the presence of a long prepuce may mask as well as give rise to the symptoms of vesical calculus, it is well to make it a custom to sound the patient

when under the influence of the anæsthetic at the time of circumcision.

Paraphimosis occurs when the tight preputial orifice is drawn back behind the corona glandis, and embraces the penis closely and persistently. It is particularly apt to occur when the subject of a phimosis has drawn back the foreskin—perhaps on account of an irritation beneath it. It has happened from children playing with each other. As an attempt to replace the swollen glans is very painful, an anæsthetic should be administered, so that the surgeon can act more deliberately and certainly. The penis should be firmly embraced by the thumb and index finger of the left hand, whilst the strangled and œdematous glans is squeezed empty of its blood and serum by the continuous compression of the fingers and thumb of the other hand. The corona may be lubricated with vaseline, and in a little while it will slip back through the swollen preputial covering. Another way of reducing the size of the glans is by tightly binding it with a piece of tape; if there be not much strangulation, the parts may be painted with solution of cocaine, no chloroform being administered.

In the child this method can hardly fail if carried out steadily and patiently; as a rule it succeeds straightway, so that in cases which are of short duration, and the tissues are but little altered, it may hardly be necessary to give an anæsthetic. In some instances the tissues have become so hard and unyielding, from a long-continued paraphimosis, that this method may fail, so that it may be necessary to pass a sharp-pointed curved bistoury well under the dorsal aspect of the prepuce and divide freely; the constricting band should not be allowed to free itself by ulceration. So soon after the reduction of a paraphimosis as the tissues have resumed their normal appearance, circumcision should be performed.

A brass ferrule, open at each end, was removed from the œdematous penis of a frightened boy; it was around the root of the organ, and the penile integument was so swollen that it bulged back over it. As it could not have been taken off by cutting pliers, or a file, without injury to the penis, the removal was effected by carefully winding a thread in close and even turns around the penis, beginning against the ferrule and proceeding towards the prepuce. As the winding squeezed the serum forwards, needle-pricks were made in the skin to allow the escape of the serum; when the end was reached, the thread was oiled and the ferrule drawn off. On removing the thread, the penis, which a quarter of an hour previously had been dropsical, was found small and shrivelled. Whenever a penis is found greatly swollen, a search should be made about its root for a constriction caused by fine wire, elastic string, or horse-hair; other causes of *œdema of the penis* are albuminuria, as after scarlet fever, morbus cordis, and extravasation of urine (page 299).

Occlusion of the meatus urinarius, either with or without some amount of hypospadias, is a rare condition. If it exist in the otherwise well-developed male child, a depression may be found on the glans marking the site of the end of the urethra. In such a case a puncture should be made with a fine bistoury, and the aperture dilated with a director; the orifice must be prevented from closing. A *membranous septum* farther along the urethra is of rare occurrence; it might be recognised, and broken through, by the introduction of the catheter for the relief of the distended bladder.

Congenital narrowing of the meatus requires patient attention. It is apt to be associated with vesical irritation and nocturnal incontinence of urine. It may be enlarged by an incision, and then

kept dilated by instrumentation. Sometimes the narrow meatus is completely hidden by a long and tight prepuce, so it is well to examine for it after a circumcision has been performed. If the meatus be small, the child will strain to pass water, and in the expulsive effort a hernia may be started or augmented. Frequently, a congenital hernia ceases to descend after dilatation of a small preputial or urethral outlet.

Hermaphroditism.—In the beginning of the third month of intra-uterine life, development has not yet indicated to which sex the fœtus shall belong. There is a rudimentary elevation for the penis or clitoris, as the case may be, and just below it is the slit-like opening of the uro-genital sinus. Later on, a fold of integument is found on each side of the penis or clitoris; if the fœtus be for the female sex, these folds grow into the labia majora, and hide the clitoris; if for the male, they join across the median raphe to form the halves of the scrotum. In the female, the lips of the uro-genital canal become the nymphæ; in the male, they join along the under surface of the penis, to enclose the urethra. Just before birth, the testes descend into the lateral halves of the scrotum.

If the development proceed from the indifferent to the highest type, a male fœtus will be the result; and if it stop short of this, a female. A partial arrest of development may occur at any stage.

A not uncommon type of hermaphroditism results when development leaves the penis without the extension of the incurved ridges below it to form the urethra, the integumental folds, though containing the testes, not being joined in the middle line to form the scrotum. Such a child, at the age of sixteen months, was brought that I might decide if anything could be done to improve the appearance. Those who had seen the child at birth had no doubt of its sex, and it was registered by the name of Florence Kate.

The labia seemed normal; the clitoris apparently was hypertrophied, and hooded with a redundant prepuce, and beneath it opened the urethra; there was no vagina. But as I discovered the testes in the lateral integumental folds, the subject was declared an imperfectly developed male, and the mother was advised to register him again with a boy's name. Nearly three years later the patient was again seen dressed as a boy; he looked a strong and sturdy

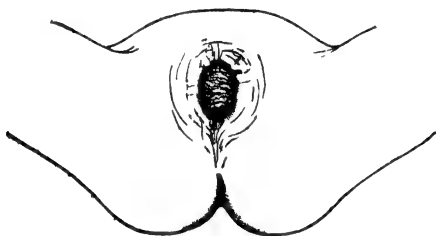


Fig. 40.—Mistaken Sex. Variety of Hypospadias.

little fellow; the accompanying illustration was made when he was between four and five years old.

It is necessary that the sex of such a child be determined at the earliest possible moment, otherwise great disappointment or trouble may be entailed.

With simple hypertrophy of the clitoris to such an extent that it resembles the male organ, a careful examination of the parts, especially as regards the existence of the uterus, quickly sets the question at rest. A perusal of the literature of the subject of hermaphroditism* shows that cases may occur in which it is impossible to say, during life, to which sex the subject belongs, but these instances are rare. In such a case one may follow the advice

* Todd's "Cyclopædia.

given by Holmes, that the child be brought up as a male, rather than expose it to the disgusting and disappointing consequences of an attempted marriage.

If an error in the determination of sex be committed, it will probably be that an imperfectly developed male child is taken for a female. This is more likely to occur when the arrest of development has affected also the descent of the testes into the rudimentary scrotal pouches ; search must be made for the testes, which may sometimes be brought down by pressing with the thumb along the inguinal canal.

Occlusion of the vagina is a congenital defect ; it rarely results from adhesion of the labia caused by antecedent inflammation. The septum extends from just below the urethral opening to the posterior commissure, and being thin and avascular, it appears grey and translucent when the labia are gently separated. If, as the infant lies on her back, the labia be firmly drawn apart by the fingers, the membrane tears through like so much wet paper, a few small drops of blood marking its connection with the labia. No instrument or anæsthetic is required for the operation. But a second operation may be needed, on account of the lower part of the septum having been imperfectly torn through, or because the raw edges were allowed to remain in contact during the healing process. The thighs should be drawn up over the abdomen, so that the parts are well exposed ; after the membrane has been torn, a small piece of cotton-wool, covered with vaseline, may be placed between the linear wounds for a few days.

The condition just described is not the same thing as *imperforate hymen*, for the membrane is between the labia majora, quite near to the surface (and is usually discovered by the nurse as she is drying the child after the bath), whilst the hymen is deeply seated, being upon the uterine side of the labia

minora. A genuine imperforate hymen is, therefore, not likely to be detected during childhood, probably not until after puberty, and does not concern us here. The discovery of the membrane between this labia majora usually creates a good deal of domestic alarm, which should be at once allayed by the prompt and simple, but thorough, rupture of the abnormal film.

Retention of urine in a male child is probably due to a small vesical calculus being impacted in the urethra; to sarcoma; or to inflammation having occluded a narrow preputial orifice, or a pin-hole meatus urinarius. If, in a child with retention, the preputial orifice be occluded, circumcision should be performed forthwith.

If neither preputial nor urethral opening be defective, a small calculus may be found, by pinching the glans, or by sounding, lodged within the fossa navicularis, and blocking the outlet; on enlarging the meatus the calculus is easily turned out. If it be impacted farther down the penile part of the urethra, it can probably be removed by slender forceps after the urethra has been fully dilated; but if it be too tightly wedged to be thus extracted, the surgeon must cut directly down upon it, and so get it away. He should, however, first try to thrust it back into the bladder by using a bulbous sound or lithotrite. Once in the bladder, it can be straightway removed by crushing (page 311). If it be fixed in the perineal part of the urethra, there may be no difficulty in pushing it into the bladder for disposal by lithotritry; but if firmly fixed by inflammatory thickening, it must be removed by a direct incision.

Retention of urine may also occur from rupture of the urethra by a blow; the presence of bruising upon the skin of the perinæum or scrotum, together with the history, will show what is wrong. Blood may escape from the meatus, or the signs of urinary

extravasation may have already occurred. In the latter case, an efficient incision in the median line will be needed. On convalescence being established, the boy will require years of surgical supervision, lest intractable traumatic stricture of the urethra supervene.

Extravasation of urine may be the result of a stone impacted in the urethra, or of a blow upon the perinæum. Whatever the cause, the treatment is the same; a free opening must be made into the urethra, or into the urinary abscess, down to the urethra, so as to ensure the complete escape of the urine. If there be no history of injury, the surgeon will search for impacted stone by the aid of a sound; but if there have been considerable suppuration or sloughing, he may fail to find it on that occasion.

If urine have infiltrated the scrotum, penis, or the inguinal region, incisions will be required, and careful irrigations with a warm solution of boracic or carbolic acid, freely diluted. The patient may be made to sit in a warm bath; stimulants, with quinine and iron, will be required. The case must be treated with promptness and thoroughness. The catheter should not be left in the bladder after the operation. The resulting contraction of the urethra will require a long-continued supervision and much patience.

Swelling around the urinary organs in boys is generally caused by extravasation of urine. But œdema of these parts may come on after scarlet fever.

Case.—A boy of eight, whilst “doing Blondin,” fell astride the top rail of a hurdle; a large blood tumour formed in the perinæum, and retention of urine supervened. The tumour was incised; a catheter (No. 6, English) was passed every other day. After a fortnight the temperature rose to 102°, and the hypogastric region became hard and tender. Pelvic abscess was diagnosed; an exploration in the linea

semilunaris discovered pus below and in front of the superior false ligament of the bladder. A counter-opening was made low in the other semilunar line, and a drainage was passed through ; the cavity having been irrigated with warm iodine water, iodoform was insufflated, and pressure applied. The temperature fell to, and continued at, normal, and convalescence was established, and the wound healed ; but twice a week a No. 7 bougie was passed, to keep in abeyance the traumatic stricture.

Priapism in early childhood is generally the result of either vesical or preputial irritation. A thorough retraction of the prepuce, or a circumcision, and a clearing of the coronal sulcus of all irritating secretions, will generally suffice to restore the parts to physiological rest. Chronic priapism may be the earliest indication of calculus. It may be caused also by ascarides, chronic constipation, or rectal polypus (page 332).

Stone in the bladder of a child is more likely to exist in the male than in the female, as in the latter it may escape through the short and dilatable urethra. The presence of a calculus may give rise to chronic priapism, and keep up constant irritation of the bladder, with urgent demands for micturition, so that the poor boy wets his trousers by day and his bed by night ; for which uncontrollable acts he is often severely punished. So great may be the straining that, with the expulsive effort, the lower bowel is involuntarily emptied. From fear of soiling his trousers he runs to the closet when the urging comes on, and sitting there and straining, prolapse of the rectum may take place. From a bruising of the congested lining of the bladder by the stone, blood may be mixed with the urine, so that the fluid is coffee-coloured. If the urine be allowed to stand, it may give a plentiful deposit of mucus or pus ; and even when freshly passed,

it may be found ammoniacal and offensive. As the bladder is emptied, the stone is forced against the tender trigone, and the child screams again ; if the stone be driven against the urethral opening of the bladder, the stream is suddenly and painfully stopped. In these circumstances the boy discovers that he can best relieve himself by lying upon his side, or by getting on to his hands and knees ; in the latter position the stone falls from the trigone towards the summit of the bladder. Whatever the position assumed by the boy, he is apt to feel pain during micturition. There is much pain at the end of the penis ; to allay this he pulls at the prepuce, which, from constant manipulation, may become elongated and inflamed. On rare occasions the fingers may be found white and sodden, like a washerwoman's, from constant soaking in the escaping urine.

The pain at the end of the penis from vesical calculus may be likened to that at the knee in hip-joint disease, and may be ascribed to some confusion in transmission through the branch of the sacral plexus to the grey matter of the cord. Branches of that plexus supply bladder, penis, and prepuce. The converse of the proposition is found in the vesical irritation which is the direct result of a long or tight foreskin. Frequently irritability of the bladder, or, as the parents call it, "weakness of the bladder," is relieved by circumcision (page 314). Sometimes, and especially so in girls, there may be little more than "weakness" of the bowel, or tenesmus, to suggest the presence of vesical calculus.

When two or more of the symptoms detailed above co-exist, the prepuce should be carefully examined, or the child *sounded*. This simple exploration is urgently demanded, or the little patient may be tormented by needless suffering. The persistence of any one of these symptoms of stone should be the hint to

sound, and although no stone be found, the passage of the instrument may effect a cure. If the result of the sounding be negative, and the symptoms continue, the child should be sounded again and again; for the calculus, if very minute, may escape detection on the first or second occasion, though, as a rule, if a stone be there, it is discovered on the first entrance of the sound. Unless the stone be very small, it may be felt by digital examination *per anum*; by this method of examination Mr. Pitts detected a second calculus impacted in the lower end of the ureter.

The injection of warm water into the bladder when one is about to search for a stone, is not necessary; but lest the stone be hidden behind a mucous fold, and so escape detection, the surgeon should turn the child on the side, and have the pelvis raised, and then, if expedient, the exploration may be completed by passing the finger into the rectum. The theory of a calculus escaping detection (or, later on, removal) from its being lodged in a sacculus in the bladder-wall is rarely acceptable; the bladder of a child is not sacculated.

If the meatus urinarius be small, or the child frightened, it will be better to "put him to sleep" before passing the sound, as by a sudden movement the urethra might be damaged. By engaging a child in earnest conversation on such a topic as that of the names of his brothers, or of his future walk in life, one may often manage to slip in the warm and well-lubricated sound before the patient's apprehension is aroused. A mixture of vaseline and oil of eucalyptus makes an excellent lubricant. The sound should have a beak rather larger than the shaft, and the beak should be short, so that it can be made to search every mucous area (Fig. 41)

Calculus in the ureter may determine symptoms of stone in the bladder, yet sounding may give a

negative result. Blank sounding should always be supplemented by help of the finger in the rectum. If the stone be small, and lodged at the orifice of the ureter, it may evade detection on many soundings ; but at last it will escape into the bladder and be struck. The surgeon should not rest contented with *one* sounding, but while symptoms persist he should examine the bladder from time to time.

A stone lying in the orifice of the ureter might be struck by certain turns of the sound, and then, on lithotomy being performed, it might not be discoverable ; later on it might escape and be found in the



Fig. 41.—The best form of Sound. The handle is cylindrical, and of metal, and the beak is short.

bed. When impacted within the orifice of the ureter, it may be best attacked and removed by the suprapubic operation (page 309).

LITHOTOMY AND LITHOTRITY.

Choice of operation.—A few years ago this question was not discussed ; every calculous boy was submitted as a matter of course to lateral lithotomy. At the present day, with an almost similar want of discrimination, boys are being operated on by the suprapubic method. We are not yet in a position duly to appreciate the value of the latter operation ; but figures may eventually show that in general application its results are less satisfactory than those of the lateral operation. Cheselden's operation has, however, a magnificent record in the past, whilst the high operation has a history which, up to the last few years, at any rate, was generally acknowledged to be anything but creditable. And even at the present time, with an improved surgical hygiene and technique,

and when adopted by surgeons of undoubted care and skill, it is not, so far as I can form an opinion, doing much towards improving its reputation. Surgeons are, moreover, having recourse to the now fashionable suprapubic operation in apparent disregard for, or in ignorance of the value of, litholapaxy for boys with small and moderate-sized stones.

Appreciation. — Lithotrity, after Bigelow's method, should be tried for all boys with a single stone; though, if this prove too large or too hard for crushing, the boy should be cut. For a hard-ringing, large stone, and for several stones, a cutting operation will be needed; but for a moderate-sized stone, which is, from hardness or dimensions, unsuited for crushing, the lateral or the high operation may be chosen, according to the fancy of the individual surgeon and the ultimate repute of the operation. For my own part, I have yet to learn that for an every-day operation suprapubic is more excellent than lateral lithotomy.

For lateral, **perineal lithotomy** no special preparation of the patient is required, further than the thorough clearing of the bowels by a full dose of castor oil, administered very early in the morning, or on the previous night. Whether the bladder be full or empty when the patient is brought upon the table matters little.

The only use of water in the bladder at the time of the operation is that its escape may afford information of the knife having entered the bladder; but the delicate sense of touch received through the knife gives this information with more trustworthiness.

The staff, which I strongly recommend to the operator who still feels himself free to make his choice of instruments, is shaped very much like the sound; the beak is quite short. Its median groove ends abruptly in a stop, just as the beak curves off; it is

James Lane's modification of Key's staff. The advantages of this staff are that it is used as a sound when the child is on the table, and that it forms a straight director from the perinaeal incision into the bladder. There is no chance of the knife slipping from its groove and failing to open the bladder, or of its leaving the groove and transfixing the posterior wall of the bladder, both which calamities have happened with the curved staff, with the inferior or lateral groove. The stop at the end of the groove of the straight staff guards the posterior vesical wall from injury, and the short beak prevents the staff leaving the bladder. The staff selected should be of a size comfortably to pass along and fill the urethra; the larger the staff, the easier is it to find the groove.

The child lying flat upon the table, and anæsthetised, the surgeon stands on the left side, introduces the straight staff, and feels and hears the click or ring of it against the stone. Of this both he and his chief assistants should be absolutely certain, for a "blank lithotomy" would be a distressing sight. If there be any doubt about the result of this final sounding, the child must be put back in bed and the operation postponed. The stone may be there all the while, or it may have escaped through the urethra subsequent to the last sounding. There is to be no exception to this rule—that, before proceeding to cut, the surgeon and his assistants are to make certain of the presence of the stone.

Then the child is to be brought to the end of the table, and the thighs flexed, and steadily and squarely held by two competent assistants; it is not necessary to tie up the child. A third assistant stands at the left side, holding the staff with the right hand, and, if necessary, raising the scrotum with the other. The surgeon sits in a chair at the breech of the patient, with a pot of vaseline, the knife, and the forceps ready

at his right hand. He runs his fingers along the ridge of the pubic arch to the ischial tuberosity, in order to take his bearings, and then, having lubricated his left index finger, he feels by the rectum for the staff, and convinces himself that the bowel is empty, and, therefore, little likely to be cut in the operation. This proceeding should never be omitted, especially when a curved staff is being used, as, after the stone has been found with the sound, the staff might have left the urethra, by a false passage, and run between bladder and rectum. This would be found out only by rectal examination, for the surgeon who uses the curved staff does not feel bound to touch the stone with it, as he has just assured himself of the presence of the stone by the introduction of the sound. Probably some blank lithotomies are to be explained by the fact of the staff having strayed, and the bladder never having been opened. It matters little how the straight staff is held in the early part of the operation, for when the groove has been entered by the knife, the surgeon takes the staff into his own hand. The curved staff should be neither thrust towards the perinæum (and rectum), nor hooked up under the pubes.

Having arranged with the assistant as to the position of the staff (by the help of the finger in the rectum), the surgeon wipes the finger, asks the anæsthetist if he may begin, takes up the knife, gives a last look to the position of the thighs and the staff, and thrusts the point of the knife well into the middle line of the perinæum, half-way between the anus and the base of the scrotum, cutting freely outwards and backwards into the ischio-rectal fossa. If this first incision be free, the second part of the operation is made more easy, as the staff becomes more accessible. Only one knife is used throughout the operation; even for very young children its blade

must not be too small, for the finger must be passed after it into the bladder.

Now the tip of the left index finger is thrust into the front of the wound, and the staff is felt in the membranous part of the urethra; a scratching with the point of the knife lays bare the groove in the staff, in which the point of the knife is firmly lodged; a little lateral movement of the knife proves the point to be securely lodged in the groove. Then the surgeon takes the handle of the staff from the assistant, and giving it a very slight turn on its long axis, so as to direct the groove more towards the line of the wound, thrusts staff and knife on together, as one instrument, by the harmonious working of the two hands. On the escape of urine, or by appreciation of his having pushed the knife in far enough, he withdraws it, and passes the *left* index finger through the bladder wound, and feels the stone. For this he takes the staff into the right hand; but if he find the wound in the prostatic urethra too small to allow of the tip of the finger being passed on to the pubic side of the staff, he enlarges it a little with the knife, otherwise he might tear through the rest of the urethral wall, and push the bladder right off the end of the staff. Probably such inefficient use of the knife at the base of the bladder is the commonest cause of blank lithotomy, for the surgeon having detached the unopened bladder, and having excavated a space by his finger in the depths of the pelvic outlet, mistakes it for the bladder. If the urethra have not been completely torn through, the timely opening of the neck of the bladder may yet prevent disaster; but if the bladder have been pushed off the staff, and the stone cannot be found and struck, the child should be sent to bed unrelieved. No speculative cuts should be made into the bladder with the forlorn hope of reaching the stone.

An important rule is not to withdraw the staff until the finger is touching the stone. As the finger is working its way into the bladder, it is stretching some tissues and rupturing others, until a free passage has been effected. When the stone is touched, and the staff removed, a slender, straight pair of forceps is run over the finger on to the stone; the handles are separated, and by a little manœuvering the stone is caught, and gently drawn out by steady traction in the direction of the pelvic outlet. If the stone be large, it may be necessary gently to work the handles from side to side, and up and down, so as to stretch the wound to the utmost; no jerking is permissible. After the stone is extracted, the finger should be introduced again into the bladder, to make sure that there is not a second stone. Some small vessel, such as a branch of the superficial perineal, may suggest the application of a ligature; or, if a bleeding artery be deeply placed, the torsi-pressure forceps may be of service; or the pressure exerted between the edges of the wound, when the legs are brought down and tied together, may suffice to check it, especially if a small piece of ice be left near the wound, or a syringe of ice-cold water be thrown into the bladder.

If these measures prove insufficient, a petticoated tube may promptly be arranged as follows:—Through a small hole in the middle of a piece of linen, about four inches square, the end of a gum-elastic tube is thrust, the linen being firmly tied around the tube about half an inch from the end. This end is lubricated, and thrust into the bladder, and the space between the tube and the petticoat is then stuffed with strips of lint.

With such compression, bleeding should cease. When the tube is tied in position, a syringe of iced water may be injected into the bladder, to make sure that the water-way is clear. As a matter of routine,

the use of the tube is not advisable, and unless actually wanted its presence is harmful.

Formerly a great deal used to be spoken about the way in which the operator should hold the knife in the various steps of a lithotomy ; he should hold it as suits him best ; for my own part, I prefer to hold it as a pen.

There is a question as to what should be done if, when the child is on the table, prolapse of the rectum occur ; my practice has been to leave it prolapsed, as to reduce it is to make the lower end of the bowel full, and to render it more likely to be damaged by the knife.

After the operation the feet should be tied together, and the buttocks laid upon a circular air-pillow, which rests upon a bed-pan of similar form, the short, hollow handle of which is kept to the side of the cot, so that the nurse, by simply looking down it, may watch against the occurrence of bleeding, and likewise inform herself of the evacuations, without moving the boy in the least.

During the first day or two, all the urine escapes from the wound, but as its edges swell from transient inflammation, some flows along the urethra ; as the swelling subsides, the urine again escapes for a time by the wound. Then, as granulations fill up the aperture, the amount escaping by the wound diminishes, and at the end of ten days or a fortnight all is well. From the moment that the child recovers from the effects of the chloroform he is happy and quiet, whereas he was previously anxious and irritated. The less the wound is meddled with after the operation the better.

Suprapubic lithotomy. — The bladder is emptied by a catheter, and then washed out with a warm solution of boracic acid, and as much of the fluid as the bladder will conveniently hold is left in it.

The catheter is withdrawn, and a ligature is placed around the root of the penis. A thin indiarubber bag may be passed into the rectum and gently distended with warm water, so as to raise the bladder into the hypogastric region, and to elevate its superior peritoneal fold. A three-inch incision is made in the linea alba, ending at the front of the symphysis. By the careful use of the dissecting forceps and director, the front of the bladder is reached; it is then seized with mouse-toothed forceps, and opened in the direction towards its neck; the stone being removed, the bladder should be explored by the finger, lest there be a second stone. The rectal bag is emptied and withdrawn. It is better not to put sutures in either the vesical or the abdominal wound. No drainage-tube is required. Annandale has advised that the stone should be brought to the vesical wound by a lithotrite introduced *per urethram*; but if the stone were not large, the surgeon who had thus seized it would rightly convert the operation into a lithotrity, and find no use for the knife.

The high operation is straightforward and free of the risk of not opening the bladder (as in certain blank lateral lithotomies), of hæmorrhage, and of injury to the ejaculatory ducts; but there is some risk of wounding the peritoneum, also of urinary infiltration occurring in the loose connective tissue around the bladder, and of septicæmia. Moreover, it does not afford to the bladder the perfect drain which is secured by lateral lithotomy. The rectal inflation should be carried out with the greatest care, or the bowel may be ruptured or involved in gangrene. Perhaps, on the whole, it is safer not to use the rectal bag, for even without it there is not much difficulty in finding the bladder without wounding the peritoneum. In one case the inflated rectum pushed the bladder to one side, and, coming forward to the suprapubic

region, was actually opened in mistake for the bladder!

The **median operation** is not suited for children, as the rigid structures which fill up the narrow subpubic arch do not allow of the easy passage of any but small stones.

Lithotrity in boys.—Lithotrity in male children has, chiefly through the skill and energy of Surgeon-Major Keegan, in Central India, become a recognised and important operation. Dr. Keegan has published a table of one hundred and fourteen operations which were performed at the hospital at Indore on boys of from twenty months to fourteen years, the average age being six and a quarter years. Of this number, four children died, or 3·5 per cent.; the average number of days spent in hospital subsequent to the operation was under seven.

Hitherto the opinion in England has been that only soft or small stones could be so dealt with, but Dr. Keegan has now shown us that oxalates of fair size, and urates of 600 grs., may be crushed and removed from the bladder at a single operation. The instruments used were Nos. 6 to 10 of the English gauge—that is, taking the smallest, No. 6, in the angle, and 5 in the stem. Dr. Freyer, too, has, I understand, crushed and removed “a very hard stone” of 700 grs. from a boy of nine years by a fenestrated No. 8 lithotrite, the operation lasting two hours. The boy was well in a few days. The evacuating tubes fitted to the wash-bottle are of the same calibre as the angle of the lithotrite. Sometimes it is necessary to incise the meatus urinarius before the instrument can be introduced.

For these operations only the best make of instrument should ever be used. It would be a terrible predicament, the bending and locking of a “cheap” lithotrite in a boy’s bladder! In using, as I have

done, Weiss's instruments, the surgeon proceeds with confidence and safety, the operation proving, with but few exceptions, simple and successful. The operation demands absolute gentleness, and not a particle of stone should be left in the bladder. The evacuating catheters should be short, and should be fitted with stylets for dislodging fragments which happen to get impacted. There should be no hurry, and the stone must be crushed into a fine powder. The instruments needed for lateral lithotomy should be also at hand, lest the stone prove too hard for the delicate lithotrite, or lest some unlooked-for contingency render the cutting operation necessary.

Lithotritry must in due course take the place of many of the suprapubic operations of which one hears so much just now in male children.

For **calculus impacted in the urethra**, see page 298.

Stone in girlhood.—The symptoms are apt to differ considerably from those in the boy. There may be little complaint of vesical troubles, whilst tenesmus, diarrhœa, and pains about the anus and perinæum may withdraw attention to the rectum. Still, there is usually irritability of bladder and incontinence. There may also be irritation about the external genitals, and the urine may contain mucus or blood. The stone may be felt through the vagina.

The child being under an anæsthetic, the stone, if small, may be withdrawn by a pair of ring dressing-forceps, though there is often difficulty in seizing it. If it be large, it should be crushed with a lithotrite, every particle being withdrawn by the evacuator.

Calculi in girls are comparatively rare, for a small stone descending from the kidney would readily escape by the capacious urethra; nevertheless, every girl with obscure symptoms about bladder or rectum should be thoroughly sounded.

For **sounding in girlhood** the patient should be in the lithotomy position and the parts thoroughly exposed; even then there may be some little delay in introducing the sound into the bladder. Holmes remarks: "I hope it may not be impertinent to point out that at very early ages the vagina may be mistaken for the urethra." This caution is extremely pertinent. If there be any doubt, a second sound may be deliberately passed into the vagina to prove that the first has entered the bladder. Or the finger may be passed into the rectum to show that the vagina is free; or the beak of the sound may be felt for above the pubes. If the child struggle so as to prevent a thorough exploration of the bladder being leisurely made, chloroform must be administered. A digital examination of the rectum should be made at the same time, as many of the symptoms of stone may be due to chronic constipation.

Incontinence of urine, or *enuresis* (ἐνουρέω, ἤσω, make water in—bed ?) may prove an extremely troublesome pathological condition. In many cases the mother or nurse regards the habit as simple carelessness, and the poor child is subjected to punishment of increasing severity. This domestic policy generally fails. At any rate, in most of the cases which have been brought to me, it has been ineffectually pursued.

I range myself upon the side of these unfortunate children, believing that they may be no more able to hold their water than they could avoid coughing if a crumb fell into the larynx. Under the high pressure of modern education children are apt to be subject, through the influence of the sympathetic system, to a simple form of diuresis. Unless the nervous and excitable child feels that he can at all times obtain a kindly permission to "retire," he must be kept beyond the risk of harm. Under the influence of

fear in a school examination I have known a healthy boy to void his urine when standing up in class. Another nervous subject, who was considered to have a "weak bladder," suffered serious distress on account of his master refusing him the opportunity of relieving himself. Occasionally the weakness depends upon epilepsy.

Though enuresis may sometimes be regarded as a passing inconvenience rather than a serious trouble, still the sooner it is overcome the better. Dr. Champneys has remarked upon the prejudicial effect which it may exert upon the ureters and kidneys. The act of micturition is necessarily associated with the damming up the urine in the ureters, and when the event is of very frequent occurrence, the obstruction may be followed by dilatation, hydro-nephrosis, and destruction of the renal tissue.* A child who constantly wets the bed had better sleep in a long flannel night-dress, as the wet sheets next to his skin become cold and chilling.

That a *long prepuce* is apt to be the cause of "irritation" of the bladder is a matter of such frequent occurrence as often to escape recognition; it is the converse of the proposition of stone in bladder and itching at the end of the penis. By day the boy endeavours to allay the symptoms by pinching the prepuce; but by night, when the brain is dormant, and the supervision of the genito-urinary tract is left to the care of the grey matter of the cord, a certain mismanagement may occur.

The sensory filaments which are distributed to the muco-cutaneous tissue at the end of the penis, are derived from the internal pudic, itself a branch of the sacral plexus. The nerves of this plexus lose themselves in the grey matter of a certain part of the spinal cord, from which are passing out, through that

* St. Bartholomew's Hospital Reports, vol. xvi.

same interlacement, the efferent fibres for the supply of the muscular walls of the bladder. This same colony of cells receives the filaments which carry up sensations from the mucous membrane which lines that viscus. It may be on account of the exceeding instability of the protoplasmic substance of those cells ; or it may be that by design and education

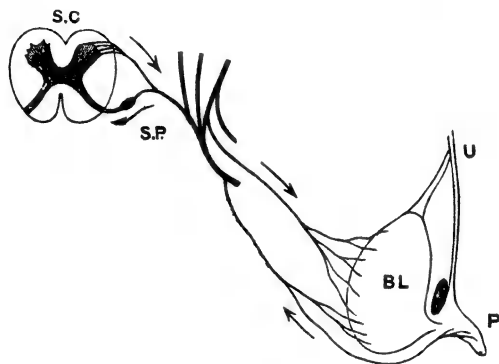


Fig. 42.

sc, Spinal cord ; sp, sacral plexus ; bl, bladder ; p, penis ; u, umbilicus.

they are specially occupied with the care of the bladder rather than of the end of the penis, that they are apt to interpret the different messages coming from the less important area as signals of distress from the bladder itself. For these signals they have but one means of relief, and this being put in force, the boy runs the risk of severe punishment in the morning for having unconsciously wetted his bed.

If there be any tightness, redundancy, or adhesion of the prepuce in a boy who suffers from incontinence of urine, this must first of all be put right. A simple dilatation of the preputial orifice may not suffice.

Contraction of the tissue will be likely to follow, and years afterwards, when the desirability of the prepuce being short and healthy is more than ever urgent, the unlucky boy is found in need of definite surgical interference. (*See page 284.*)

If there be nothing in the condition of the prepuce likely to account for the vesical irritation, a careful examination should be made of the meatus of the urethra; if this be no larger than a pin-hole, it must be incised and kept permanently dilated by the insertion of a tapering bougie. But some days or weeks may elapse after any operation before the bladder entirely frees itself of its bad habits. When enlarging the meatus by the scalpel, the nick should be made vertically, and at the lower part of the meatus.

If both prepuce and urethral orifice be found, after careful inspection, perfectly normal, inquiry should next be directed to the condition of the bowels; the child may be the subject of habitual constipation, in which case he will improve on a course of rhubarb and soda. Or, if constipated and anæmic, he may make greater progress under the influence of a course of laxative iron mixture. The close association existing between the bladder and rectum through the network of spinal and sympathetic nerve fibres, renders the possible dependence of vesical irritation upon a loaded rectum evident; the presence of a rectal polypus, also, may give rise to incontinence of urine (*page 332*).

An excess of nitrogenised food may possibly render the urine irritating; and the child should not be allowed stimulants of any kind; he should feed only at regular meal-times, and cakes and sweet-stuff should be prohibited. The child should not be allowed to eat or drink just before going to bed. I have not found, however, that restricting the amount of meat eaten in the course of the day is an

important element in the treatment of the case. Nor have I found the use of belladonna or creasote of that value which one is led to anticipate.

In the practice of other observers, however, belladonna has acquired a considerable reputation. It should be given in steadily increasing doses, and at intervals of from two to three hours, until, by the dilatation of the pupils or other signs, it becomes evident that the toxic effect is obtained. Then for some hours the administration should be remitted, and subsequently continued in smaller amount. We may begin with four minims of the tincture, and, carefully watching the effect, steadily increase it. To give it in a fixed and limited dose, as one administers tincture of iron, for instance, is not calculated to obtain the therapeutic value of the drug. Children are peculiarly tolerant of belladonna.

A good deal may often be done by breaking the excito-motory chain of the sleeping child of its bad habit by taking him out of bed once or twice in the night for the purpose of micturition ; this may be done at the time of the parent or nurse going to bed or getting up, or the child may be roused at an earlier hour in the morning. The child should not be allowed to lie upon his back, as in that position the urine may probably excite a greater irritability. A cotton-reel harnessed over the lumbar vertebrae will ensure his sleeping on the side.

But if a combination of circumstances lead to the suspicion that the irritation is due to vesical calculus, the patient must be sounded once, twice, or as many times as necessary (page 301).

All the irritability may cease on the sound being introduced, even though no stone have been detected, and it should be adopted as routine practice in the treatment of enuresis, even although no symptom of vesical calculus, beyond that of irritability, exist.

To admit that this treatment is empirical is not to detract from its practical value: one does not yet understand how it is that the application of a small blister to the groin suffices at times to put an end to the night screams of the child with hip-joint disease. But the fact remains, nevertheless.

If the enuresis be simply the result of a bad habit, the way in which the sounding (which is to be repeated if necessary) may act is very evident. In every instance the surgeon may suspect at the beginning that the trouble is due to the presence of a stone.

Heed must be given to the reaction which the urine has when freshly passed; if it be extremely acid, the child may be advantageously treated with a course of soda and gentian. Possibly such a child is born with potential gout or rheumatism: one frequently finds that an infant with eczema pudendorum has a parent at that very moment, or at no distant period, laid up with an attack of gout or rheumatism. A child with such an heredity may have a diathesis which yields to the very same drugs which best suit the parents.

If the urine be alkaline when freshly voided, as happened lately in a most obstinate case of incontinence, the child's health must be improved by tonics of the mineral acids, and if advisable by a change of air and diet; or the reaction may be altered by a course of benzoic acid in doses of two, three, or five grains, in sweetened water. Too much confidence must not be placed in the use of drugs alone; attention must be paid to all the accessory means of treatment; but the improvement obtained is very apt to be ascribed entirely to the medicine given.

A drug of which patient trial may be made in intractable cases is morphia, in doses beginning at the twenty-fourth part of a grain; whether it acts through the nervous system as a stimulant or sedative,

or whether it acts directly through the urinary secretion, is uncertain. The effect of a small blister of cantharides over the sacrum may be tried.

It has been suggested that strychnia may act by improving the condition of the sphincter fibres at the neck of the bladder; it seems more probable that its influence may be rather upon the tone of the tissues generally. It may be in this form of enuresis (where the sphincter vesicæ has become indolent or has lost its tone) that electricity will be of service. In using the weak, continuous current a wide-faced negative electrode should be placed over the lumbo-sacral spine, whilst the positive one is moved over the perinæum and hypogastric region for about five minutes every day.

Of the treatment of enuresis by elastic bands or pads applied to the urethra I have no practical experience, nor do I desire it. Cases are on record where unhappy children, in their anxiety to prevent their wetting the bed, have tied a ligature so tightly round the root of the penis as almost to cause gangrene. (See page 294.)

If every effort to cure the child have proved disappointing, it is still a consolation to the parents to learn that the trouble will for certain wear itself away. Little boys suffer from it much more than older ones; and as puberty approaches, the disease is sure to fade away. In the meanwhile it is not advisable that the child wear an indiarubber urinal at night, in order to spare the wetting of the bed. Such an apparatus would be calculated to render nurse and parents less earnest in their endeavours to hurry on the cure, whilst the effect upon the child would be extremely prejudicial.

Incontinence of urine in girlhood.—Much of what has been remarked above applies equally to incontinence both in boys and girls; but in the case

of the female child, the trouble may be due to the presence of a vascular polypus at or within the meatus urinarius, which, by irritating the peripheral nerves, disturbs the vesical system, much as does the retained smegma in the other sex. Such a polypus may be no larger than a pin's head, or it may be the size of a currant; it is a bright papillary outgrowth of the urethral lining. For its detection the patient must be anæsthetised, and placed in the lithotomy position in a good light. The urethral walls may be held apart by the blades of dressing forceps, the polypus being removed by a snip with the scissors.

On making a careful examination of a girl who was troubled with incontinence of urine by day as well as by night, it was found that the floor of her urethra was deficient.

If a girl be the subject of incontinence, for the cause of which repeated examinations offer no suggestion, nor empiric treatment provides relief, it may be advisable to dilate the urethra and explore the interior of the bladder with the finger; experience shows that the paralysis caused thereby is transient and is often extremely beneficial.

A most inveterate case of incontinence, in a girl of about nine years of age, completely recovered when, as a last resource, the urethra was dilated. The left index finger introduced into the bladder found nothing abnormal. Previous to introducing the finger the urethra was dilated by the dressing forceps. Dilatation by the use of laminaria tents is unadvisable; in a case under the care of Giraldés such treatment was followed by tenesmus, vulvitis, and enlargement of the inguinal glands. Nor should the treatment by dilatation be adopted until every other means has had fair trial.

Hydro-nephrosis.—From congenital defect in the ureter, bladder, urethra, or prepuce, the urine may

quietly collect in the kidney, and, expanding its wall, may quickly or eventually form a large, dull tumour in the upper part of the flank. The disease may exist on each side. The size of the tumour may diminish with the escape into the bladder of some of the pent-up urine. The diagnosis from chronic abscess, or sarcoma, may be determined by the aspirator, the fluid withdrawn being watery urine of a very low specific gravity. The tumour may be dealt with by *massage*, aspiration, or, if necessary, by incision through the loin, with antiseptic washing and drainage. In the case of a **traumatic hydro-nephrosis** in the Children's Hospital, under Mr. Pitts, recovery took place after persistent massage. (*See also page 314.*) The child had been run over.

Hæmaturia generally results from vesical calculus, and in every case of blood-stained urine the child should be sounded. Other causes are injury to the kidney, bladder, or urethra; foreign body; malignant or papillomatous disease; acute nephritis, ascariides, hæmophilia (page 58), and renal calculus.

Rugous bladder.—Occasionally, on sounding, the lining of the bladder is found roughened by prominent folds which impart to the sound a peculiar leathery feel. What the exact pathological condition may be, I cannot say; certainly, the sensation is not due to the presence of tubercular or villous disease. Sometimes there is a mortary feel on sounding, as if the rough wall were coated over with phosphatic deposit; and this may actually be the case, although the urine is at the time acid. Possibly from errors in diet, or from other causes, the urine had been previously so acid as to irritate the mucous membrane and set up cystitis, when the phosphates were at once thrown down. Indeed, the rugous condition of the lining itself may have been the result of a quiet and chronic antecedent cystitis. No wonder if such a

bladder become irritable and suggest the presence of stone.

Treatment.—For a time the boy should be put to bed and carefully watched, the bowels being kept regular, or even relaxed. Cod-liver oil and iron may be prescribed, and a light diet, containing plenty of milk, should be ordered. Oranges and other fruit will be useful, and if the urine still be found over-acid, small doses of citrate of potash may be given. When the child is allowed to get up, he should be very warmly dressed, and should be kept out of the reach of cold winds and wet weather.

Of polypoid tumours of the bladder.—The history might begin as one of vesical irritation, then stone would be suspected; the sound, or in the female the finger, may detect a strange substance, and the exploration would be followed by further bleeding. No radical treatment short of suprapubic or perineal cystotomy would be likely to avail. Digital exploration through a perineal incision should be undertaken, if only to ensure free escape of urine and *débris*. The tumours may be simple myxomata or sarcomata, and in either case they are likely to be multiple, pedunculated, and growing from the trigone. In the female they may protrude from the meatus urinarius.

Case.—A boy of six was admitted for retention of urine, a condition to which he had lately become liable. Just before sending him into hospital his medical attendant had had difficulty in introducing a catheter; when in the hospital the house surgeon also met with obstruction. On my seeing the boy, soon after admission, there was much difficulty in passing the instrument, and there was evident fulness in the perineum, probably from extravasation of urine; perineal section was performed. After a day or two this incision failed to afford sufficient escape for the urine,

so the wound was continued on into the bladder. (See page 298.) A severe outbreak of scarlet fever then occurred in the ward, and the child took infection and sank. Post-mortem examination made by Dr. Chaffey showed that the obstruction was caused by a sarcomatous growth starting from the trigone and blocking the neck of the bladder.

Vulvitis is common in weakly or strumous children. It may be due to the presence of thread-worms, which have immigrated to the vulva from the rectum. Sometimes the inflammation is the result of dirt, or of incontinence of urine. It may be associated with eczema of the pudenda and thighs, or with strumous ulceration of the mucous membrane. Possibly the inflammatory attack may be caused by the lodgment of a foreign body.

The tissues are swollen, red, and painful. Attention may first be directed to the condition by the linen being soiled; by the child constantly rubbing or scratching the parts, or by the frequent micturition.

The **treatment** of acute vulvitis will require the adoption of soothing measures, and absolute rest in bed. The first examination of the parts should be thorough, and may even need the administration of chloroform.

Frequently in the course of the day the child may be made to sit in warm water, to which an antiseptic solution has been added. A mild lotion may also be used with a syringe, the labia being subsequently kept apart by strips of wet boracic lint. After each washing, the labia should be carefully dried by a soft towel; they may then be dusted over with starch-powder, or anointed with vaseline and eucalyptus. If the urine be strongly acid, acetate or bicarbonate of soda may be given. The food should be of a fluid and unstimulating nature.

When the acuteness of the attack has passed off iron and other tonics will be required.

Gonorrhœa.—Vulvitis of venereal origin is occasionally met with, but the disease possesses no characteristic feature whereby it may be certainly recognised. The profuseness of the discharge offers no differential feature. If the parts were bruised or torn, the suspicion of the child having been wronged would be grave; but when precocity and hysteria influence a clever girl, a simple leucorrhœa may be made the subject of an accusation which is as groundless as it is serious. Parents are naturally anxious and suspicious when a child is suddenly found to be the subject of purulent vaginitis; the discreet practitioner will do all in his power to allay groundless fears, and prevent the child being made an object of curiosity or of harmful attention.

In certain districts of England, where superstition lingers, and charms and spells are still believed in, the adult male is apt to be under the apprehension that the specific urethritis from which he suffers can be straightway cured by contact with a child; in this way, as in others, gonorrhœal inflammation may be communicated. If there were nothing wrong before the time of the alleged rape, and if a thick and copious discharge were noticed within a few days of it, with the occurrence of much swelling and scalding, the suspicions would be grave indeed. Whether the presence in the discharge of certain micro-organisms can be taken as positive evidence of gonorrhœal infection, it is as yet too early to say.

The **treatment** will be that described above; it is expedient to begin with the administration of a dose of rhubarb and soda, or of castor oil. The child should be made to sit in a mild, warm, antiseptic solution. This should be done at least twice a day—night and morning. Being surrounded with a blanket,

the child may remain in the bath for fifteen or twenty minutes. A weak lotion of boracic acid, corrosive sublimate, or other astringent and antiseptic may be used with a common glass syringe, and a small piece of salicylic wool being inserted between the labia. Absolute rest in bed is a most important element in the treatment.

Aphthous vulvitis is spoken of by Sarazin* as of common occurrence in hospital practice, especially in connection with an attack of measles. The parts are to be frequently washed and carefully dried, finely powdered iodoform is to be dusted over the membrane, and the labia are to be kept apart by a small tuft of iodoform wool. Constitutional remedies must be employed, and the child kept in complete rest.

Noma.—Noma is a limited gangrene of the generative apparatus. It bears a close relationship as regards pathology to both hospital gangrene and cancrum oris. (*See* page 197.) It is more frequently met with in girls than boys; I have on one occasion only seen it attack the scrotum.

Noma vulvæ is apt to attack the child who has been reared in an atmosphere of poverty and dirt, especially if her constitution have been taxed by a recent illness such as diarrhœa, measles, or scarlet fever. The subject of limited gangrene from acute inflammation is entered into in chapter xiv.

The result as regards ultimate deformity by cicatrization compares favourably with that left after cancrum oris; the lax and abundant tissue in the pudendal region is readily drawn up to obliterate the gap left after the separation of the slough. Should ulceration implicate either commissure of the vulva, or the adjacent margins of the aperture, careful dressing would be demanded; or should a partial

* "Revue Mensuelle des Maladies de l'Enfance," 1884.

atresia supervene, a plastic operation might be required.

The fever and exhaustion associated with noma are often extreme, and it is no wonder that the miserable child who is the subject of the disease sinks under it. During the separation of the slough blood-poisoning is apt to set in.

CHAPTER XXI.

THE RECTUM.

Imperforate rectum.—During foetal life the upper part of the rectum, which is developed from the internal blastodermic layer, descends into the pelvis, but is separated by a considerable depth of tissue from the surface of the perinæum. There a depression is found in the skin, at the site of the future anus, which, deepening into the pelvis, forms a shut sac, the upper end of which is fused into the blind end of the bowel to complete the outlet. If absorption of the partition fail to take place, complete intestinal obstruction must result, though the anus itself may be well formed :—An infant three or four days old had passed nothing ; the nurse had dosed it with castor oil ; it was desperately sick. On introducing the finger, a septum was detected ; this was broken through with a director, and the opening dilated with dressing forceps. At once a motion was passed, and the child did well. Such cases may give perpetual trouble from contraction of the remaining annular constriction (Fig. 44).

A girl of five years was under treatment for a constriction an inch and a half within the anus, which

was so unyielding that all that could be done was to wash out the faecal accumulations from time to time by an irrigator. Excision of the hardened tissues is a speculative and unsatisfactory procedure. If the obstruction cause constant distress, the question of colotomy may be considered.

Imperforate anus.—Occasionally, when the rectum is perfectly formed, a thin membrane skins over the anal orifice; the diagnosis and treatment are evident. If the anus be small, it will require dilatation with the finger, the nurse being taught how to treat the child. In every case of obstinate constipation careful inspection of the anus, and of the lower part of the rectum, should be undertaken (Fig. 45).



Fig. 43.—R, Pelvic portion of Rectum, descending towards outlet.

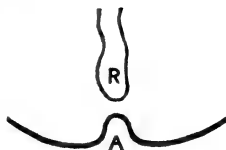


Fig. 44. — R, Imperforate Rectum; A, anus.

There may be no trace of anus, though the pelvic part of the rectum is properly developed. It is then necessary to introduce a sound, as a guide, into the bladder or vagina, according to the sex, and, with the child in the lithotomy position, to dissect up along the sacral curve in search of the bulging *cul-de-sac*, exploring carefully with a firm director. If the search prove successful, dilatation must be effected by the dressing forceps and finger, and the nurse subsequently instructed how to maintain the dilatation. To diminish cicatricial contraction, the end of the bowel should, if possible, be brought down to the surface, and there secured by sutures (Fig. 43).

Mayo Robson advises that this dissection be

carried up into the peritoneal cavity, and that the dilated pelvic piece of the rectum—or, failing that, the colon—be brought down and opened, and secured at the surface-wound. Thus the artificial anus would be made in the very best place. I have not yet performed this operation, but I shall take the earliest opportunity of doing so.

Littre's operation.—But if the search prove ineffectual, the child should be placed upon its back, and an incision made in the left iliac region, somewhat as if an iliac artery were about to be tied, but the peritoneum is to be opened. The first piece of intestine to escape is usually the sigmoid flexure, but it is attached by so wide and free a mesentery that it might be taken for a piece of small intestine; absolute size of bowel is no guide as to its kind. The colon being greatly distended, no trace exists of the longitudinal muscular bands, but on following the bowel towards the pelvis its identity becomes established. An assistant should then gently compress it with the finger and thumb above and below the spot at which it is to be incised, lest, whilst the edges of the opening are being stitched to the skin wound, meconium find its way into the peritoneal cavity. The best dressing is a liberal one of absorbent wool.

I have had occasion to perform this operation on six infants with imperforate rectum.* The first did well for three months, at the end of which time another attempt was made to establish a perineal anus, a flexible bougie being passed down the sigmoid piece of the bowel; this operation was accomplished, but post-mortem examination showed the serous covering of the rectum to have been damaged. The second was a male child, whose acute symptoms were relieved by the operation, but who died three days later. The

* *Brit. Med. Journal*, 1880.

third had peritonitis at the time of operation, and died on the fourth day after it; the lower part of the rectum was represented by a firm fibrous cord. The fourth case was similar. The fifth perfectly recovered from the colotomy; but after three months, on an attempt being made to establish the perineal anus, fatal peritonitis supervened; the pelvic piece of the rectum was found ensheathed with peritoneum. The sixth case resembled the third.

In five of the six cases the sickness stopped as soon as the intestinal contents found escape, the children obtaining immediate relief; and two of the children

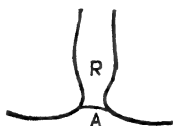


Fig. 45.—Imperforate Anus.

R, Rectum; A, anus.

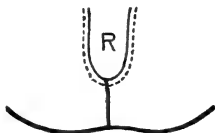


Fig. 46.—Rectal Cul-de-sac surrounded with Peritoneum, and ending in fibrous cord.

might possibly have been alive now had I but rested content with the permanent artificial anus.

That the loin operation, *Amussat's*, may be successfully performed in children is beyond question, but it can rarely be done without implicating the peritoneal sac, on account of the colon being almost entirely surrounded in a loose and long mesentery. Though the peritoneum be wounded in two places in the loin the child may recover, just as it may after the groin operation (*Littre's*); but the latter operation is so rapid and easy of performance that it should always be chosen. Other objections to *Amussat's* operation in these cases are that the descending colon is apt to have wandered from its normal position, even to reach the right side of the abdomen; and that

the large intestine may be absent or imperfectly developed. If the groin operation be undertaken, this can be leisurely made out, and, if necessary, the small intestine opened. "It is argued in some surgical works that the surgeon should abandon to death the subject of imperforate rectum. I doubt the morality of this reasoning; I do not think we have the right to abandon a patient to certain death if we know of any means likely to save him" (Holmes). If no operation be performed, the child dies in great distress, unless the bowel empty itself by abscess and fæcal fistula (page 280).

That a groin anus is not, after all, a dreadful condition is shown in Curling's* essay; speaking of a lady so afflicted, he says: "She constantly enjoys the best health, goes into society, attends balls, and no one would suspect her to be the subject of any infirmity. She is married, has borne four children, and her pregnancies and labours have been quite normal."

Prolapse of the mucous membrane, or invagination of the bowel out of the wound, is apt to occur after the establishment of artificial anus, and discharges from the bowel set up troublesome dermatitis, taxing the resources of the medical attendant, the patience of the parents, and the endurance of the child. The greatest local cleanliness is necessary. Lint spread with vaseline must protect the surface, and a soft pad of carbolic tow in gauze should be worn over the opening.

A reference to Fig. 38 shows how the rectum may open into the bladder, urethra, or vagina. Sometimes it opens upon the front of the perinæum through a narrow fistulous tract. If there were not solid material in the fæces, these abnormalities would be of comparatively slight importance; perhaps the least serious irregularity is that in which the fæces are discharged *per vaginam*.

* Trans. of Med.-Chirurg. Society, vol. xliii.

Prolapsus ani.—From constant straining, the mucous membrane becomes congested and hypertrophied, and the tissue of the submucous layer so stretched that the lining membrane bulges in a dusky annular fold outside the anus; but in certain extreme cases the muscular coat of the bowel also descends. It may not be in itself a disease, but, like hernia (page 363), should be regarded as a symptom. Among the children of the poor it is often the local expression of constitutional weakness. Sometimes it is the result of the weakness and of the forced expulsive effort of whooping cough or chronic diarrhoea; or it is due to the straining associated with habitual constipation, worms, rectal polypus, phimosis, or stone. In a case of obstinate prolapse the preputial and urethral orifice should be inspected, the rectum should be explored with the finger and the bladder with the sound.

The **treatment** will vary with the cause; but it is advisable at the outset to pass the finger gently within the relaxed anus. If the rectum be found loaded with hardened fæces, rhubarb and soda mixture three times a day may commence the treatment. The child should not be allowed to sit upon closet seat or chamber utensil, but should be made to lie upon his side and pass the motion into a cloth. If, notwithstanding this precaution, prolapse recur, the mother or nurse should be instructed to pull the skin from the neighbourhood of the anus, upwards over the ischial tuberosity, each time a motion is to be passed, so as to put the mucous membrane of the lower bowel on the stretch. Simple enemata may be of service.

The habit of allowing a child to sit for an indefinite time trying to pass a motion is reprehensible in the extreme. I have already referred to the danger of letting a constipated child sit over a chamber vessel containing hot water (page 157).

If diarrhoea cause prolapse, the bowels should be

thoroughly evacuated, and then kept quieted by castor oil and opium ; rhubarb and soda mixture, and afterwards a course of soda and gentian, or cod-liver oil and iron with an occasional laxative, may be resorted to. Prolapsed bowel should be well washed with warm or cold water, carefully dried with a soft cloth, dusted with finely powdered alum, and returned by firm but gentle pressure as the child lies upon the face. This position should be kept up as much as possible, a large pillow being placed under the pelvis and thighs. If the case be obstinate, it may be advisable to fix the buttocks close together by a wide piece of adhesive rubber strapping or soap plaster, so that the prolapse is mechanically impossible. The child should be kept prone, with the pelvis raised to the utmost.

The diet should consist chiefly of milk, egg, and beef tea ; coarse bread, oatmeal, fruit, and vegetables, should not be allowed ; and all food should be given cold. Even in the worst cases I have never found it necessary to resort to the use of nitrate of silver, the cautery, the scalpel, or any other heroic treatment, and I apprehend that such measures can rarely be justifiable.

Polypus is associated with great irritability of rectum and bladder ; the child strains and cries at stool, and often passes nothing but a little blood and mucus. The vascular growth may be attached to the wall of the bowel by a pedicle of sufficient length to allow of its escape during defæcation ; it is then tightly grasped by the spasmodic contraction of the sphincter, the sensory nerves at its base are dragged down, and the boy screams with agony. The mother, examining for cause of the distress, may catch sight of the polypus, if it have not already been drawn up again. She may correctly describe it as being of the size and colour of a ripe currant or cherry.

Even without the mother having seen it, the history

is almost indicative :—The frequent going to the closet, the bleeding, and the agony when the polypus has protruded and been caught by the sphincter. Many of the symptoms are those of vesical calculus.

With prolapse of the rectal lining, the anus is dilated; but in the case of polypus, it is in a condition of habitual and spasmodic contraction, so that before making a digital exploration an anæsthetic should be administered. In every case of bleeding from the rectum, methodical search should be made for polypus; it is so movable on its slender stalk that it may be taken for a fæcal nodule.

Treatment will consist in dilating the anus, pulling down the polypus, and tying its pedicle tightly with a strong waxed ligature. Unless quite small, it is not advisable to tear it off with the finger nail when the bowel is being explored, as troublesome hæmorrhage may arise from its artery.

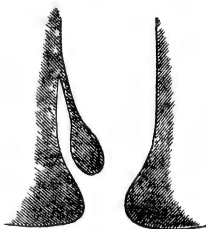


Fig. 47.—Rectal Polypus.

Anal abscess.—Suppuration is usually superficial, and begins in gland tissue about the external sphincter. Though the neighbouring parts may be red and angry, they soon quiet down after the pus has escaped, and the short fistulous track closes up without further trouble. This simple condition is altogether different from that of

Ischio-rectal abscess, which may arise without definite reason, or may be caused by a piece of bone which has been swallowed and passed through the wall of the bowel. The sooner that the tension of the inflamed tissues is relieved, the better; one must not wait for fluctuation, but with a finger in the bowel as a guide, the knife should be thrust into the mass.

Fistula-in-ano results, for which the ordinary operation will be eventually required ; the parts should have quieted down before the external sphincter is divided, and at the time of operating the sinuses should be thoroughly scraped over.

In connection with the **treatment** of fistula-in-ano, certain cautions may be given. It must be ascertained that the sinus is not associated with chronic bone disease. Spinal abscess occasionally finds its outlet through the ischio-rectal fossa (page 252), in which case a probe may pass an indefinite distance into the interior of the pelvis ; or a soft flexible bougie may be directed towards the carious vertebræ. The skin looks dusky and undermined, and with ordinary care it is hardly likely that a subject of this condition would be submitted to operation. These questions should be satisfactorily answered :—Has the child with a deep fistula a stiff or excurved back ? has he disease of the sacro-iliac synchondrosis (page 458) ? is he tubercular ? Even without disease of joint or bone the tubercular child may be the subject of anal fistula, and to subject him to a cutting operation might be to hurry on a fatal result. The tuberculous nature of anal fistula must always be suspected, but if this suspicion be confirmed, it does not necessarily follow that the fistula is not to be operated on (page 63).

Condylomata are large and soft ; they grow in crops near, not *at*, the anus. The neighbouring skin is moist, and probably similar tubercles are to be found in other regions. For treatment, *see* page 77.

Nævus of the rectum may be associated with serious hæmorrhages. To obtain an adequate view of the vascular mass a speculum should be introduced, the child being under chloroform. It is best treated by the thermo-cautery. (*See* page 137.) Hæmorrhage

must be arrested by plugging with strips of lint saturated in an astringent solution.

I have met with several cases of rectal nævus, and Mr. Barker has recorded one to the presence of which, later in life, fatal hæmorrhage was due. (*Med.-Chirurg. Trans.*, vol. lxvi.)

CHAPTER XXII.

INTESTINAL OBSTRUCTION.

INTESTINAL obstruction may be acute or chronic. In the former variety the child is suddenly taken with vomiting, and has pains across the umbilical region. He cries out or screams with pain, and may even be attacked with convulsions. The pain may be subject to intermissions and paroxysms; indeed, this is generally the case. Sometimes the first severe attack is preceded by warnings of colicky pains; often extreme collapse comes on with the first severe pain. Thus the prominent symptoms of intestinal obstruction are just those of an ordinary strangulated hernia, and though there is much truth in the statement that the internal strangulation demands active operative interference in a no less degree than an external hernia, still the analogy is not quite correct. The most likely cause of acute obstruction in a child is intussusception; and in many a case this has yielded to insufflation, or even to the unaided effort of nature; while for an unreduced ~~strangulated~~ hernia there can be but one issue. Unfortunately, moreover, when an intussusception has been correctly diagnosed and promptly operated on, the life has not often been saved by the procedure. Hitherto the outlook has

been so bad that some practitioners in every case of intestinal obstruction set their face against operation. Equally unsurgical would be the state of mind of him who would approach every case in the spirit of speculative activity.

From the commencement of the distress no motion or flatus may have been passed, though the bowel below may have emptied itself soon after the first attack of vomiting. There may be scanty dejections of fæculent mucus even after the occurrence of strangulation. Either with or without urgent or evident straining, mucus tinged with blood, or blood alone, may be voided; sometimes blood is passed in considerable quantities. If the strangulation be high in the small intestine, it is possible that extravasated blood may tinge the mucous vomit, though during life it might not be possible to say whether this comes from the stomach or the engorged capillaries at the strangulation.

At first the matter vomited will be the contents of the stomach, and later on the bile-stained fluids of the duodenum; still later the vomit will be fæculent. Probably the sickness is the direct result of the shock to, and continued irritation of, the sympathetic system, just as it is by shock to the solar plexus that a boy struck in the "pit of the stomach" when at play, is attacked with vomiting. But persistent vomiting is evidently due to the fact that the contents of the bowel cannot be driven beyond the obstruction. The more persistent the sickness, the less the abdominal distension, as the flatus escapes with the vomit. So, also, when the obstruction is not absolute, diarrhœa may be persistent, gas escaping *per anum*, and the abdominal wall remaining actually flat throughout.

Causes of acute strangulation.—A terminal piece of the ileum may be invaginated into the cæcal end of the colon, or there may be invagination

in the small intestine itself, or in the large intestine. There may be a twist of the small or large intestine, or a piece may be caught and compressed by a diverticulum, or some abnormal band or adhesion, probably the result of foetal peritonitis (page 278). Sometimes not only does a piece of the ileum pass through the ileo-cæcal valve into the colon, but the cæcum itself, and some of the ascending colon, are carried into the transverse arch of the colon, or even down to the rectum, and out of the anus. In this condition a tumour may sometimes be made out by digital examination through the abdominal walls, the patient being under the influence of an anæsthetic, and the trunk well flexed. Such tumour would be firm and sausage-shaped, and might be found in almost any region of the abdominal cavity. The colon, in childhood, is very loosely attached.

Invagination may be due to the irritation set up by a polypoid growth in the bowel, or by some diverticulum; or it may be due to an exaggerated peristalsis set up by diarrhœa, or by the presence of intestinal worms, or some other irritant. More than one invagination may exist in the same child.

Invagination is frequently met with in the bodies of children who have died of various diseases, and wholly independent of any symptoms of disorder of the bowels during the patient's life-time.

Even an infant may be the subject of acute internal strangulation; usually the patient is under two years of age, and very often under six months. The higher in the canal that the strangulation occurs, the less will be the abdominal distension, but the sooner will collapse supervene. In almost every case vomiting comes on at the moment of the strangulation taking place, or very soon after its occurrence. The constant vomiting, the dread of swallowing even simple fluids, and the sympathetic irritation combine

to diminish the amount of renal secretion. When the strangulation is at the ileo-cæcal valve, a firm, abnormal mass may possibly be detected by palpation, deep in the right iliac fossa; but when the abdomen is tightly distended by inflated bowel, palpation can

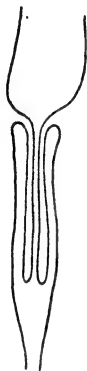


Fig. 48. — Invagination of Small Intestine.

hardly be of service. The distension may be diminished, however, by puncturing the bowel through the abdominal wall with a fine canula and trocar. Examination by the finger in the rectum must always be made; possibly it may reveal an intussuscepted mass of large or small intestine. The ordinary situation of hernia must be explored, and inquiry made as to whether the child had been the subject of hernia. If left to itself, the invaginated piece of intestine may, in the course of a day or two, become so swollen and agglutinated as to be incapable of readjustment; the opposed serous surfaces adhere so firmly that if by good fortune the strangulated knuckle should slough off, the continuity of the tube might become re-established, and recovery take place. As in external strangulation, gangrene of the bowel may rapidly supervene.

Considerable pieces of invaginated bowel may be happily cast adrift and discharged *per anum*; even the caput cæcum coli, and some of the small and large intestines have so passed, and the child has recovered. But for a surgeon to stand by a child in whom he has confidently diagnosed the existence of an invagination, and to hope for such a result, is, to say the least, unreasonable.

The report of an instance of spontaneous recovery would attract much attention, whilst very possibly

fifty children might have died of unrelieved strangulation without special record being made. Thus nature becomes accredited with a power of working a cure in internal strangulation, which, if misapprehended, is likely to involve grave disappointment.

The **treatment of acute strangulation** has hitherto, it must be confessed, been extremely unsatisfactory. It has comprised the administration of opium and other sedatives, purgatives, and copious enemata ; insufflation of the bowel by the use of common bellows ; massage, under chloroform, either with or without insufflation or enema ; fomentations ; and, lastly, abdominal section.

First, the **physiological method** consists in the insurance of absolute rest for the stomach and bowel by withholding all food by the mouth and nutritive injections by the rectum—the latter being calculated to excite peristalsis. Small and repeated doses of laudanum are given by the skin, and the child is allowed to suck ice. Absolute starvation may thus be borne for many days ; it is the strangulation which produces exhaustion. Such treatment should be adopted at the outset of every case of acute obstruction, though operation might eventually be required.

The administration of purgatives could but add to the local and constitutional distress ; and as anything taken by the mouth produces a fresh attack of vomiting, only a very little iced water can be kept down. From the moment that internal strangulation is diagnosed, every purgative must be withheld. The bowel demands rest, and this is best obtained by the liberal administration of *opium* hypodermically ; but though this drug may mask the symptoms, it cannot remove their exciting cause. It is useful in that it checks the vomiting, quiets peristaltic action in the bowel, and calms the patient ; but it will be harmful if it cause the surgeon to regard the patient's condition in

a less serious light. The improvement which it effects is apt to be specious, and the relief and sleep obtained by its administration must not be misunderstood. It should be given until the child is brought fully under its influence, but it must be withheld as collapse approaches. What is wanted, in all such cases, is *rest*. Treves bears testimony to the value of opium: "There is certainly no one drug of more use in cases of intestinal obstruction. It can dull the severe agony that often marks the earliest stages of acute strangulation."* He has no doubt that in many severe instances a death early in the case has been averted by the timely use of opium.

Fomentations by flannel under oil-silk will give some relief, but cannot influence the strangulation. Laudanum may be freely sprinkled upon the flannels.

Copious enemata of warm water, or *distension of the bowel by air pumped per anum* by a pair of bellows, has, in certain instances, produced the effacement of an obstruction, especially if the child have been inverted at the same time, and the abdominal walls have been gently but firmly kneaded (the child being, of course, under the influence of an anæsthetic). But if under inversion and manipulation a tumour, which was evident previously, have now disappeared, it must not be concluded that the strangulation is relieved; the mass may simply have hidden itself behind coils of inflated intestine.

To be successful, this kind of treatment must be employed before the opposed serous surfaces at the invaginated bowel have had time to become adherent. For this purpose, it might be employed during the first twenty-four hours, and not later than thirty-six hours from the onset of vomiting. When once tried, there should be an end to the method. If it fail to

* "Intestinal Obstruction" (Jacksonian Prize Essay, 1883).

do good, it is likely to do harm to the inflamed tissues, by disturbing and straining them. The cases in which it may possibly be of avail are those in which there is invagination of the small intestine into the large, for fluid cannot pass back through the ileo-cæcal valve to efface an invagination in the ileum or jejunum.

Distension of the bowel, by whatever means effected, should be performed with the greatest care and delicacy. If the child be inverted, the oil or water may be allowed to enter the bowel by a flexible tube, through a funnel raised a few inches above the buttocks. The bowel, especially if softened by inflammation, might easily give way under the pressure produced by the use of a Higginson's syringe, whilst a slender tube would probably coil up soon after entering the sigmoid flexure. My colleague, Dr. Cheadle, has recorded (*Lancet*, 1889) several instances of the successful treatment of obstruction by inflation and massage, and he remarks that in these days of "the apotheosis of abdominal surgery" it is well to call attention to this milder method.

Abdominal section is the only method of active treatment on which reliance can be placed, and its performance is demanded in every case where the diagnosis of acute intestinal obstruction has been made. Hitherto it has usually been resorted to when too late. This operation is for internal strangulation exactly what herniotomy is for external strangulation. That its adoption has not hitherto been attended with excellent results must be admitted, but not to the prejudice of the operation. Almost invariably, it is resorted to only when the child is in the very condition from which a bolder policy might have rescued it. That the operation of abdominal section does not in itself entail a great risk is evident when one sees with what success ovarian tumours may be dealt

with ; the scrupulous cleanliness of modern surgery has banished most of the dread, which was inherited from previous generations of surgeons, of opening the peritoneal cavity. Probably the chief reason of abdominal section being regarded with such disfavour in the case of acute internal strangulation is that it is not resorted to early enough.

The account of a case in which abdominal section was successfully performed by Marsh, for intussusception in an infant seven months old, is recorded in volume lix. of the Transactions of the Medico-Chirurgical Society.

Case.—Fourteen days previously the infant had been seized with diarrhœa, sickness, and occasional griping pains ; tenesmus supervened, and the motions contained mucus and blood. Then a mass of bowel, in which was clearly seen the ileo-cæcal valve, protruded from the anus. Chloroform was administered, and futile attempts were made by insufflation, and by the injection of warm water into the large bowel, to reduce the invagination. A sausage-like tumour could be felt extending from the left of the umbilicus down into the pelvis. An incision two inches long was made in the linea alba, just below the umbilicus ; the entering piece of bowel was happily drawn out of its sheath ; the wound was closed with hare-lip pins, and, under the influence of opium, complete recovery was quickly obtained.

Marsh is of opinion that if the diagnosis be certain, and other means have failed, the operation ought to be at once performed. That it ought to be performed, *first*, in cases in which strangulation is acute and quite recent—that is, if not more than twelve or eighteen hours' duration ; *secondly*, in cases which are chronic, and in which there have been no symptoms of inflammation or strangulation.

A similar case is described by Hutchinson, in

volume lvii. of the Transactions of the Society, in which the operation of abdominal section had a successful issue. The symptoms were not those of acute strangulation; they had come on rather suddenly about a month previously; a fortnight before the operation a piece of bowel had appeared through the anus, which the child was constantly straining to eject from the rectum. Warm water enemata were tried in the usual manner, but without avail.

The operation consisted in making a short opening into the abdomen just below the umbilicus, and in drawing out the entering piece of bowel. The wound was closed with pins and sutures; and cotton-wool and strapping were used as the dressing. The reduction was easily accomplished, as the parts were not adherent or even inflamed. In this paper other cases of intussusception in children are recorded, and special reference is made to the importance of carrying out a thorough digital examination of the rectum in all obscure cases; and also of distinguishing an intussusception from a mere prolapse of the lower bowel. (*See paper by Barker, Lancet, August, 1888.*)

The **operation** should be performed in the *linea alba* in those cases in which a tumour is to be made out in the middle line or to the left of it; but if the mass be clearly made out, and be fixed, in the right iliac fossa, the peritoneal cavity may be opened by a curved incision near the front of that iliac crest. With a tumour in the right iliac fossa, there is almost certainly invagination through the ileo-cæcal valve; when the tumour is in the left fossa, it may still be invagination through the valve, but it had better not be sought through the left groin, lest, if an artificial anus have to be made, the ascending colon be dragged a needless distance across the peritoneal cavity. The median incision serves best.

During the operation, and especially so if the

room be not warmed, the child's limbs, pelvis, and chest should be covered in cotton-wool, as the shock from exposure and cold may of itself prove fatal.

The incision in the middle line, below the umbilicus, should not be longer than may be necessary for the admission of two or three fingers into the peritoneal cavity, otherwise the operation may be impeded by the ready escape of distended coils of intestine. If the tension of the bowel be very great, careful puncture may be made with a fine canula; the puncture-wound thus made would not require treatment. In opening the peritoneum, care must be taken that a distended piece of bowel do not start up and damage itself against the knife.

The abdominal cavity having been opened, the cæcum should be first explored. If this be found empty, the obstruction will be in the small intestine, which must then be examined, care being taken that its coils be not allowed to protrude. If the cæcum be full, the colon must be traced along, and then the rectum itself examined.

If no tumour, band, or twist be discoverable when the cavity is opened, the fingers may be directed beneath the distended coils which lie in the right iliac fossa; then the left side may be explored. If still no strangulation be met with, the empty coil may be followed upward until the fault be reached. If this be of the nature of a *band*, it must be secured between two pairs of torsi-pressure forceps and divided; a *volvulus* must be carefully unfolded; in short, the strangulation must be dealt with as occasion may suggest. The wound should then be closed by sutures which include the peritoneum, and by finer superficial ones, and dressed with a pad of sublimate wool and many-tailed binder.

Intussusception.—If an *invagination* be discovered, it may be drawn up to the wound for

examination, when, if from agglutination of the opposed surfaces of peritoneum, the invaginated piece of bowel refuse to be drawn out, even when it is being helped back by manipulation on the outside of the ensheathing piece, it will be inadvisable to attempt the separation by rude force; such treatment would almost certainly cause an immediate or subsequent extravasation of the contents of the bowel.

Possibly the reduction may be effected altogether within the



Fig. 49.—Improvised Clamp.

abdominal cavity, and by manipulating the ensheathing piece between the finger and thumb, rather than by drawing on the entering piece of bowel. The softened tissues must be very gently handled.

If the adhesions be firm, or from any other cause a piece of the intestine be deemed untrustworthy, compression of the bowel above and below that part should be made, the damaged piece being excised. This important procedure should be conducted outside the abdominal cavity, the bowel being carefully clamped before being cut. Indeed, it may be clamped

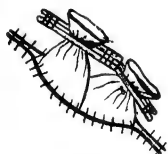


Fig. 50.—Artificial Anus, bowel clamped and sectioned.

in two places at the proximal side, and in two at the peripheral side of the portion to be removed, and the division made between each pair, the part being first emptied by the finger and thumb, so that the operator may not be embarrassed by escape of the contents.

The clamps, which practical experience has approved, may be made of stiff pieces of gum-elastic catheter laid side by side, with their ends firmly approximated by indiarubber rings or simple ligature. The protruding pieces of bowel may then be secured to each other, and to the margin of the wound,

by fine sutures which pass through the serous coat. The opening into the peritoneal cavity having been thus securely blocked, and the tissues well lubricated to preserve them from irritation, the clips would be removed by cutting the elastic band or other ligature, and the contents of the bowel allowed to escape.

Absorbent wool, under carbolised tow, makes a good dressing; iced water only should be allowed by the mouth, lest vomiting be started again and the bowel be thereby disturbed. The day after the operation a teaspoonful or two of egg and brandy is to be administered occasionally. Nutrient enemata (of peptonised milk) should be withheld for at least 24 hours, and even after that they should be administered only in small quantities and with great discretion. The presence of alimentary matter in the lower bowel is sure to excite peristalsis in the small intestine, and at this time absolute quiet is demanded. If the child survive the operation, an attempt should be made on a future occasion to render the upper piece of bowel once more continuous with the lower.

Enterotomy is an operation for the relief of intestinal obstruction which has much to recommend it. It is a simple procedure, and one which involves comparatively little shock or loss of blood. An incision of an inch in length is made through the abdominal wall a little above the line of Poupart's ligament, and the first piece of bowel met with is fixed to the margins of the wound and subsequently opened. Thus relief is at once afforded to the obstruction. If, as is expedient, the opening be made upon the right side, an inflated coil of the ileum is almost sure to be seized. No search is made in the abdominal cavity for the cause of the obstruction; the hope is that matters, whatever they may be, will

right themselves. The over-distended bowel is paralysed; enterotomy ensures immediate evacuation, though it leaves the obstruction possibly unrelieved.

If the case be one of intussusception, as it most likely will be in a child, the opening made by the surgeon may suffice to tide the patient over the crisis, and allow complete and successful separation of the invaginated piece of bowel by sloughing. If the cause of the obstruction be of a less serious nature, the operation may be expected to afford complete relief. Later on the wound might be closed. Thus the surgeon is not called upon to separate adhering coils of inflamed bowel, nor to disentangle friable involutions. Happy is he if the exact nature of the acute strangulation be never made apparent to him!

Case.—A female infant of two days was admitted on account of incessant vomiting; she had passed a trace of meconium. The abdomen was tumid; digital exploration under chloroform showed the anus and rectum to be perfectly developed. As the obstruction was not absolute, a delay of twenty-four hours was advised with the view of giving nature a further chance. At the end of this time, the infant being worse, an opening was made, as described above, in the right iliac fossa. Immediate relief followed, but the patient sank six days later. The autopsy revealed a matting of the intestines from old, intra-uterine inflammation. There were no signs of tuberculosis.*

Chronic intestinal obstruction may be caused by the slow contraction of deposits left after peritonitis, by stricture at the junction of the pelvic and anal portions of the rectum (page 327), by imperfect development of the anus, or by invagination of the large intestine (for with this last condition

* *Brit. Med. Journal*, June 13th, 1885.

the symptoms are not necessarily acute), by habitual constipation, or by the compression of some new growth. The prominent symptom is the smallness of the fæcal evacuations, and the increasing difficulty of producing a free motion. The child becomes feeble, dyspeptic, and sick; and when the obstruction is at or near the rectum, a doughy mass of hardening fæces may be detected by firm pressure in the left iliac fossa. Above the stricture the bowel will become enormously expanded by accumulation, and ulceration of the thin wall may determine a rapidly fatal peritonitis. Sometimes the constipation is associated with a watery diarrhoea, the result of irritation of the mucous membrane of the bowel. Chronic peritonitis may begin at, and be confined to the neighbourhood of the obstruction, but it may in time become general.

A careful examination of the bowel should be made by the anus, and if an organic stricture be found, it must be dealt with as suggested on page 328. Mild cases of obstruction may be trusted to recover without any surgical interference. If the cause of the obstruction be obscure, and the symptoms be increasing in severity, the **treatment** should be directed towards the quieting of the alimentary canal by the administration of small doses of opium. Purgatives must be avoided. If the symptoms become worse, it may be the duty of the surgeon to open the abdomen by a small incision and explore.

The **dieting** of the subject of intestinal obstruction, either in the acute or chronic form, is a highly important matter, and, on the lines of Sydenham, has been recently formulated by Mr. Thomas. In the severer forms of obstruction during the first four or five days there may be a loathing of all food—too short a period to kill by starvation; a little iced-water must be the only food allowed. Anything more

substantial would probably be followed sooner or later by a fresh attack of exhausting sickness. Even nutrient enemata must be withheld, as they will probably excite peristalsis in the neighbourhood of that piece of the bowel which needs absolute rest.

After these few days, if the physiological treatment (page 339) prove effectual, vomiting and thirst will be greatly controlled, and hunger will set in. Then small quantities of suitable foods may be given—some of the yolk of an egg beaten up with a little brandy, some beef-jelly, or purée of chicken. Probably milk will not be a good article of diet at first, on account of the firm coagula which it forms.

Hardened masses of fæces in the sigmoid flexure may be softened by enemata of warm water and oil, and broken up by manipulation through the abdominal wall. The surgeon must personally administer such enemata; it is too important a matter to be handed over to a casual attendant. Massage, when methodically and repeatedly employed, has proved an excellent mechanical tonic to the torpid bowel.

Perityphilitis is usually started by ulceration and perforation of the vermiform appendix. This may be caused by a pin or other foreign body in the appendix; thus—by gangrene, tubercle, or by chronic constipation. Impaction of hardened fæces is a fruitful cause of the disease. When the fact is clearly recognised that the common cause of inflammation in the neighbourhood of the cæcum is perforation of the appendix, exploratory surgery will be more generally, promptly, and successfully resorted to for its relief.

The inflammation is associated with local pain and tenderness, which, with paralysis of the bowel, tenesmus, and perhaps vomiting, may for a time lead to the suggestion that the case is one of obstruction of the bowel, due to intussusception of the ileum into the

cæcum or colon; but the symptoms soon become local and definite, and on closely questioning the parents it may be elicited that on a former occasion the child suffered from a somewhat similar though less severe attack, which had, however, been ascribed to some indigestible food having been taken.

Symptoms.—These are fulness, hardness, and persistent pain and tenderness in the right iliac fossa; the bowels are confined; and constitutional disturbance is severe. The child is flushed and anxious, and lies with his knees drawn up, and greatly objecting to the right thigh being extended. Indeed, if this flexed and rigid position of the thigh be associated with pains near the knee, as may happen on account of the pressure upon the anterior crural nerve, the case may be mistaken for one of hip-joint disease. On chloroform being administered, however, the movements of the hip-joint are found to be quite free, whilst a definite tumour is discoverable in the iliac fossa.

Again, the pains in the limb and the general stiffness (?) of the abdomen and back may suggest spinal caries and iliac abscess; but this diagnosis is negatived by the shortness of the history and the acuteness of the local pain and tenderness. Moreover, on the administration of the anæsthetic the back is found to bend easily in any direction whilst the iliac swelling shows no sign of extending beneath Poupert's ligament. The acute pericæcal abscess may thus be distinguished from the chronic purulent collection of spinal caries (page 259). The skin over it is dusky and œdematous; and when gas has escaped into it from the ulcerated bowel, emphysematous crackling may be detected on palpation.

In due course the inflammation extends to the connective tissue around the cæcum (*περι, τυφλός*); if hardness give way to a feeling of doughiness, or even of obscure fluctuation, *iliac abscess* may be suspected.

Vomiting nearly always occurs in children ; it was present in all of Meigs and Pepper's thirteen cases. "It is never stercoraceous, and, indeed, is rarely troublesome unless the constipation is marked, or perturbing treatment has been adopted in the beginning of the attack." The skin becomes red and shining. There may be discharge of mucus and blood *per anum*. In due course the child becomes pale and exhausted, and is covered with profuse perspiration.

If the perforation of the bowel occur in the wall of the cæcum, before inflammation has set up firm adhesions to the surrounding tissues, a fatal peritonitis is the almost inevitable result ; but if advancing inflammation should have glued the bowel to the abdominal parietes abscess may form in the iliac fossa, or become discharged through the groin without the general peritoneal cavity having been implicated. If suppurative peritonitis occurred, it would be expedient to give the child the benefit of abdominal section, and irrigation of the peritoneal cavity, and drainage.

Case.—In June, 1886, I saw a child of eight years who had had abdominal pains for three days, with occasional attacks of sickness ; nothing had passed per anum. She had peritonitis, which had apparently started in the right iliac fossa. On opening the abdomen through the linea alba, we discovered pus and fæculent matter in the neighbourhood of the cæcum, and a perforation of the vermiform process. The process was ligatured and amputated, and the peritoneal cavity was washed out, but the child, unfortunately, did not recover.

It is not always easy to distinguish acute peritonitis from intestinal obstruction, and where there is any doubt, and the case looks hopeless unless operation may perchance afford relief, it is manifestly right to give the child the benefit of abdominal section.

The **prognosis** in perityphlitis is by no means

desperate. Indeed, if the treatment have been that of *rest and opium* from the beginning, and the abscess approach the skin over the iliac fossa, the chance of recovery is favourable. Sometimes the disease ends in resolution without abscess having been formed. Increasing fulness and tenderness suggest suppuration; if softness occur in the middle of the brawny mass, and obscure fluctuation be detected, the evidence of abscess is sufficient.

The **treatment** demands absolute rest. Exploratory manipulations, and the administration of purgatives and enemata are all harmful. Nutrient enemata should not be prescribed; they excite the lower bowel. From the moment that a painful fulness has appeared in the iliac fossa, the child should be kept absolutely quiet in bed, and allowed but small quantities of easily-digested liquid food. Opium is to be constantly given in small doses. This, indeed, is the only drug in which any confidence is to be placed.

Two or three leeches may be applied just above the iliac crest, and when the bites have ceased to bleed the tender region may be covered with spongio-piline or a poultice. The abscess should be opened without timorous delay. As soon, therefore, as there are good grounds for believing that pus is collecting it should be sought for, after the method of Hilton, and gently let out. An acute abscess near to the peritoneum is a source of constant danger, as at any moment it may penetrate the serous membrane and set up a fatal inflammation. The nearer to the iliac crest that the exploration is made, the less the danger of opening the peritoneal cavity. Iodoform dustings and pads of tenax form excellent dressings. The cavity should not be distended by irrigator or syringe.

CHAPTER XXIII.

HYDROCELE, AND DISEASES OF THE TESTIS.

AT an early period of development there is nothing in the structure of the internal organs of generation to indicate to which sex the foetus will eventually belong. The testis or ovary is placed in the renal region to the front of the Wolffian body. The testis reaches the internal abdominal ring at about the seventh month. During the eighth month it is in the inguinal canal, and at birth has generally reached the depths of the scrotum.

The descent through the external abdominal ring may be delayed for some days or months after birth; or, appearing now and then outside the ring, the gland may as constantly be retracted. A testis which lingers in the canal or at the ring may be encouraged by well-directed and frequent manipulations to complete its descent. The testicle which long delays its descent is apt at last to appear in close company with a piece of bowel; probably the adhesion is the result of limited peritonitis. If there be a congenital hernia, and the testis of that side have not made its appearance, I should be disinclined to advise the permanent wearing of a truss, lest the late descent of the gland be prevented; for at or just after puberty the healthy testis may make its complete descent. It is not certain that a testis which has thus failed to complete its intended course will eventually be valueless; nevertheless, it is generally imperfectly developed when it lingers in the canal or just outside the abdominal ring. When, therefore, I find a small and undescended testis associated with a reducible inguinal

hernia, I am inclined to recommend removal of the gland and complete and permanent closure of the inguinal canal, as described farther on (page 371).

Misplaced testis.—Though the testis have left the abdominal ring, instead of passing into the scrotum it may wander into the groin or perinæum, but beyond the limits of the deep layer of the superficial fascia of the groin and perinæum it is unable to stray. A testicle in the perinæum might eventually preclude its possessor from horse exercise, and, if injured, might demand ablation, but it is questionable if a trial of the operation of transplantation to the scrotum should not be advised. It is only recently that I have come to adopt this operation of transplantation; but such experience as I have of it is entirely favourable. I certainly would not waste time over an operation to transplant an imperfectly developed testis; indeed, it can only be from sentimental reasons that the surgeon is constrained to leave a misplaced and worthless gland, when, on account of its position and imperfect development it is specially exposed to injury, and liable to malignant disease (*Lancet*, Feb. 9, 1889).

A testis has been known to leave the abdomen by the femoral ring, and to reach the surface of the thigh through the saphenous opening. (I have operated upon a woman in whom the ovary had taken this unusual course.*) If there be any doubt as to the nature of a small, firm, and oval swelling in the neighbourhood of pubes, perinæum, or Poupart's ligament, the scrotum should be examined with reference to the presence of both testes.

If one gland be absent the finger should be made to sweep with firm pressure down the course of the inguinal canal; this may suffice to bring the lingering testis within the grasp of the finger and thumb. If the testis, coaxed down from the ring, be inclined to

* *British Medical Journal*, 13th December, 1873.

ascend again, the pad of a truss might obstruct its return.

Fig. 51A shows the testicle behind the peritoneum passing into the inguinal canal. Fig. 51B shows it in the scrotum behind the cul-de-sac which is to persist as the tunica vaginalis. In Fig. 52 the tunica vaginalis has separated from the funicular process.

Obliteration of the tubular prolongation should

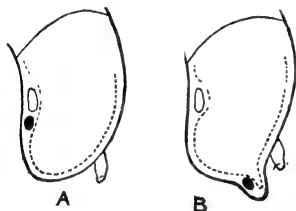


Fig. 51.—Schemes showing descent of Testis behind Peritoneum.

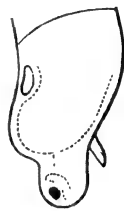


Fig. 52.—Tunica Vaginalis, connected with Peritoneal Sac by Fibrous Thread.

take place soon after the testis has passed into the scrotum ; a slender fibrous cord then connects the peritoneal sac with the tunica vaginalis (Fig. 52).

In some animals the tubular canal persists between the abdominal and scrotal serous sacs, and even with us the shutting off of the latter sac may be long delayed. Thus, serous fluid, moistening the peritoneal cavity, may gravitate into the tunica vaginalis, a **congenital hydrocele** being the result. The fluid can be emptied into the abdominal cavity by placing the patient on his back, and raising the scrotum ; but on lowering the pelvic region the fluid trickles down again. If the spermatic cord be then loosely pinched at the external abdominal ring, and the scrotum squeezed by the other hand, the fluid may easily be felt gurgling up the narrowed passage. If, when all the fluid has

been returned, pressure at the ring be remitted, the fluid again descends.

This examination shows that scrotal fulness is due to serum, not to intestine. In the latter case the descent would have been sudden and massive. Congenital hydrocele and hernia (page 366) often co-exist, and in the case of but a slight scrotal fulness in a little child the test of translucency may be impracticable.

In employing it the room should be darkened, the front of the scrotum screened by the hand, a lighted taper or vesta held on the other side of the scrotum, and inspection made through the tube of an old-fashioned stethoscope, or by means of a sheet of paper rolled up so as to leave a lumen of about the diameter of a cedar pencil.

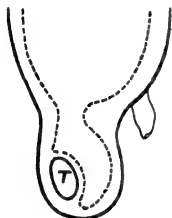


Fig. 53. — Congenital Hydrocele. T, Testis.

Congenital hydrocele requires less surgical interference than is sometimes lavished upon it. With the help of a truss it will almost certainly disappear. Parents generally regard the tumour with apprehension, and urge that something be done for it. In such circumstances a weak solution of iodine may be painted on the scrotum; this can do no harm. Lotions of spirits of wine, sal ammoniac, and other drugs, have been recommended. They render the parts wet and uncomfortable, whilst their therapeutic value is more than doubtful, at least in my experience.

The size of the opening through the narrowest part of the funicular prolongation may be no larger than a goose quill. Its complete obliteration is desired, lest, under the influence of fluid pressure, or during an attack of vomiting or coughing, it allow of the descent of a knuckle of intestine. The aperture may be so

slender as to induce the surgeon to regard the occlusion perfect. To inject such a hydrocele, with a view of producing a radical cure, might be to set up fatal peritonitis. Obliteration may be best accomplished by the constant pressure of a well-fitting truss.

If the hydrocele be so large as to interfere with the truss, the fluid may be drawn off by a fine, clean canula. Or it may disappear by extravasation into surrounding tissues through punctures from an ordinary sewing needle. If the punctures be made rapidly they are almost painless; they probably have a stimulating effect upon the tunica vaginalis, and restore the balance of secretion and absorption, after the manner of electrolysis.

In **funicular hydrocele** the tubular prolongation of peritoneum has been shut off from the upper part of the tunica vaginalis, whilst its communication with the peritoneal cavity persists. In this variety the testicle is below the hydrocele, and the tunica vaginalis is empty.

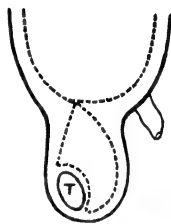


Fig. 54.—Hydrocele of Tunica Vaginalis and of Funicular process (Infantile).

In **infantile hydrocele** the fluid collects in the tunica vaginalis, and in the funicular process, communication having been cut off from the peritoneal cavity. The tumour is pear-shaped, with the stalk extending up to, or even within the external abdominal ring. The swelling is translucent, and unyielding, no fluid escaping under pressure. Such a hydrocele should not be injected; the surgeon cannot be absolutely certain that the occlusion is perfect. The cyst may be occasionally punctured with a needle, or, if necessary, the fluid may be withdrawn by a fine canula, after which that side of the scrotum should be carefully strapped (Fig. 54).

Ordinary hydrocele of the tunica vaginalis is not so common in childhood as are the other varieties. It may get well with acupuncture.

But if it be ascertained that a troublesome and persistent hydrocele has no communication with the peritoneal cavity, the radical treatment may be resorted to without further delay. On to the end of a slender silver or steel probe a thin crust of solid nitrate of silver is melted in the flame of a spirit lamp. The hydrocele sac is then emptied by a canula large enough to admit the end of this probe, with which the

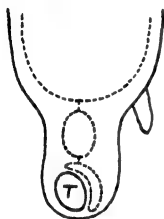


Fig. 55.—Encysted Hydrocele of Cord.

lining of the empty sac is then gently scratched. The inflammatory swelling which ensues quickly subsides, and the hydrocele is probably cured. It is unsafe to inject iodine or any other irritant; I have known extensive sloughing of the scrotum follow that treatment, probably on account of the leakage of some of the injection into the subcutaneous tissue.

Encysted hydrocele of the cord

frequently escapes recognition; it is often met with in the surgery of childhood both in boys and in girls. I have sometimes seen children wearing trusses over such cysts. In feel and size they resemble a testis. At times they are so hard as to appear solid growths. If close up against the ring they must be drawn down for examination. Examination by transmitted light is impossible when the tumour is high up, and covered with fat. Without doubt it is sometimes difficult to recognise for certain an encysted hydrocele which is lodged in the inguinal canal. But if it seem to have a definite upper limit it is not likely to be a hernia; moreover, it is fixed and painless. If the scrotum contain both the glands it cannot be an undescended

testis ; and as the swelling does not increase in size it cannot be a commencing sarcoma.

A hard, rounded swelling above the testicle, and in the course of the spermatic cord, can rarely be anything else than encysted hydrocele ; so that when it has been steadied and fixed by the fingers and thumb, a fine canula and trocar may be thrust into it. But the surgeon must assure himself that the swelling is not associated with a piece of intestine ; the external abdominal ring must be quite clear. About half a teaspoonful of pale serum will escape, and the tumour disappears, perhaps for ever, but the hydrocele may possibly require evacuation on subsequent occasions.

Encysted hydrocele in the canal of Nuck.

—Close below the external abdominal ring is a round, hard swelling, perhaps small enough to be pushed up into the inguinal canal, from which it will descend again, unaltered in size. On pulling it down towards the labium it is found to have no definite connection with the interior of the abdomen. It may have been there for days or weeks as a hard, painless swelling. It is rarely large enough for examination by transmitted light. Puncture by a grooved needle confirms the diagnosis, and dissipates the tumour.

Acute orchitis may be the result of a kick or blow, or of sudden and forcible adduction of the thighs. In childhood it is rarely an associate of mumps.

Acute epididymitis may be due to some irritation or abrasion of the urethral mucous membrane, such as may follow the escape of a vesical calculus, the passage of a sound, or a lithotomy-knife. If the epididymitis be secondary to urethral irritation, the vas deferens will be found swollen and tender along the back of the cord. With acute inflammation of the testis or epididymis, the child will be in great distress, the scrotum being red and swollen. He should be

placed upon his back in bed ; a full dose of castor oil may be given, and a leech may be applied ; quinine and iron may then be prescribed. Though the acute inflammation is apt to be followed by atrophy of the gland, this would proceed slowly, and long before it was recognised the patient would probably have passed from under supervision ; this atrophy is due to pressure of effusion within the fibrous capsule. Thus it might be expedient to secure immediate relief to the tension by a few punctures by a grooved needle. The application of a lotion of lead and opium does not fully meet the urgent demands, but the leech is of great service. If the testis remain thickened from chronic inflammatory effusion, the scrotum may be strapped with adhesive rubber plaister, or covered with collodion.

Chronic strumous inflammation of epididymis or testis may appear even in early childhood, the affected part being extremely hard, nodular, and indolent. If the disease begin in the epididymis, it will spread to and implicate the spermatic cord and the body of the testis. Both glands may be affected. If the child be carefully fed and clothed, and cod-liver oil and iron be prescribed internally, and inunctions of the oil externally, the hardness may disappear as health improves. The deposit may increase, and soften in places from caseation ; the scrotum then becomes adherent, the skin becomes dusky and undermined, and the débris is eventually discharged.

Fungous granulations from the exposed testis are best treated by the powder of red oxide of mercury, the child being kept off his feet and brought under the influence of oil and iron. But if he be very weak, and if the destruction of the testis be so great as to give little prospect of recovery, castration is needed. A miserable child has recently been under treatment for strumous orchitis, in whom extensive sloughing of

the scrotum took place, the testicle being left uncovered. The child quickly sank.

Syphilitic orchitis is a rare manifestation of hereditary taint; both glands may be affected, the swelling being for the most part even, regular, and confined to the body of the testis. The treatment which is found invariably successful is mercurial inunction. Small doses of iodide of potassium, or of iodide of iron, might be also given.

Malignant disease of the testicle.—When the testis is growing rapidly into a large, ovoid, firm, and comparatively painless mass, sarcoma must invariably be suspected. The diagnosis may for awhile be obscured by fluid in the tunica vaginalis; but there is the hard mass which can be neither of blood nor serum. Exploratory puncture is useful in confirming diagnosis; it can do no harm—a drop or two of blood escape.

If the disease be allowed to run its course, the scrotum will be involved, and a fungating mass will start through the ulcerated or sloughing skin, the child wasting rapidly and dying exhausted. Castration at the earliest moment holds out the best hope of recovery, but even this treatment is often followed by disappointment, deposits being usually found *post-mortem* in the lumbar glands, the lungs, or in some other viscus. The enlarged glands may almost fill the abdominal cavity.

For the most part, when a testis is hard, painless, and steadily increasing in size in spite of treatment, castration is required, and the sooner that it is done the better. The child who has been previously pale and fretful, who has been losing appetite and getting thinner, may at once improve when the diseased gland is removed. Delay affords time for secondary implication of the lumbar lymphatic glands.

Operation.—The child having been anæsthetised, the scrotum and adjoining parts are again washed with

a weak solution of carbolic acid, and an incision is made from near to the external abdominal ring down to the base of the scrotum. For this purpose the integuments are pinched up between the finger and thumb, and transfixed; the cord is laid bare, and, with the testicle, is raised from its bed. A trustworthy, aseptic gut ligature is passed round the entire cord and firmly tied. A simple reef-knot should not be used, as the gut is apt to come untied; the knot should be supplemented by an extra half-hitch. The spermatic cord is then cut below the ligature, and the testicle removed. Having seen that there is no bleeding, the ends of the ligature are to be cut at a little distance from the knot; the wound is washed with a solution of corrosive sublimate and then closed. A small drainage tube is laid through the bottom of the wound, and the edges brought together by a continuous suture of fine gut. A dry dressing of iodoform, salicylic, or sublimate wool is applied; the thighs are tied together, and the knees bent over a pillow. Small doses of laudanum may be required, and wine if there be much depression. The drainage tube should be removed next day.

The ligature should be tied well above the testis, and if the vas deferens or the lymphatic tissue of the cord be thickened, the higher the spot at which the knot is placed the better. Sometimes it is necessary to pull the cord from within the inguinal canal, the knot being afterwards drawn up out of sight. It is inexpedient to tie the cord in two pieces; and to leave the ends of the ligature protruding from the wound is undesirable, as it delays the complete healing. The risk of recurrent hæmorrhage has, I think, been overestimated; I, at any rate, have no experience of it, but the chromicised gut, unless softened in hot water, does not make a trustworthy ligature, as it is apt to slip, and to become untied.

Dermoid cysts may contain bone, hair, or other strange material; they would probably be noticed soon after birth. The tumour would be hard, painless, and irregular in shape; the mass is apt to undergo suppurative inflammation. The *treatment* available is ablation, and if in the course of the operation the testicle were found but imperfectly connected with the mass, absolute castration might not be demanded. (See also page 127.)

CHAPTER XXIV.

HERNIA.

General remarks.—It is well to regard a hernial protrusion as the result of some abnormal condition rather than as a pathological entity. The theory will not always hold good, but as a general rule it will be found to afford an excellent working hypothesis. It is the instrument maker who says, "If the child is ruptured he requires a truss."

Information should be obtained as to the circumstances in which the "rupture" first appeared, and what is now most calculated to bring it down. In one case the hernia first came, perhaps, with a fit of vomiting, and now after every meal the child is sick and the tumour appears. Thus the treatment must be directed to the feeding of the child. If he be at the breast, is he allowed to overload the stomach? How often is he fed? If the reply be, "I give him the breast whenever he cries, and I let him have as much as he will take," the mother is to feed him at regular intervals, and for a limited number of minutes

by the clock. Each case must be treated on its merits; and the more precise the directions given the more likely they are to be attended to. If the child be brought up by hand, attention must be given to the nature of the food, of the bottle used (page 13), and to the way of feeding. Violent expulsive efforts must be checked before the child can be cured of the hernia. If the hernia come down with coughing, medical aid will be required. A long uvula may be the cause of either coughing or vomiting.

With some children the hernia appears during micturition: are the preputial and urethral orifices free? is a long or adherent prepuce keeping up peripheral irritation and making the child strain? is there a vesical calculus? (page 300). Diarrhoea, chronic constipation, and also rectal polypus (page 332), may cause a hernial protrusion, or retard its permanent disappearance. A child should not need to strain at defæcation, nor should he be allowed to sit long upon the vessel. If the child be premature, or badly developed, he must be kept warm, and rubbed with cold-liver oil; he must not be allowed to wear a binder nor anything to constrict the abdominal cavity.

General remarks concerning trusses.--

To apply a stiff truss to an infant is likely to cause eczema, excoriations, or pressure sores, either in the groin or where the band of the truss passes across the lumbar spine. The pad, moreover, when wetted with urine, is hard and discomforting. A slight hernia may get well in the first or second year of life without treatment by rigid trusses, and if a careful supervision be kept over the little child with congenital hernia, he may possibly do without any truss. But if a truss be required, care must be taken that it fits, and that a second is kept in reserve; frequently I have found the truss so adjusted as to allow the escape of the bowel, and to exert pressure upon it afterwards.

A badly-fitting truss is far worse than none. The pad should fall flat over the ring, pressing very gently upwards and backwards, and, like the band, should be evenly covered with soft, clean linen. For the bath, a truss covered with indiarubber should be used, but not with a strong spring, as is so often the case.

For tender infants, spring-trusses are ill-suited ; for them Lund's plan of treatment should first be tried. A folded skein of Berlin wool should have the loop-end laid over the emptied inguinal canal—the other ends being carried spike-wise above the opposite pubes, across the front of the abdomen, and over the hip of the weak side. This running end is then passed through the inguinal loop, carried round the inner side of the thigh, and over the buttock, to be firmly secured to that part of the skein which is already just above the great trochanter. The infant can be washed with this truss on, a fresh one being subsequently applied. For a little child that is running about, Ward Cousins' washable truss, which has no spring, ought to receive fair trial. It is supplied by Messrs. Maw.

If a congenital hernia have not disappeared whilst the child was always in the mother's arms, or in the cradle, it may probably get worse as he begins to run about, so that a truss must be obtained. But when he is running about it is more difficult to find a truss that will keep the bowel always up. When the truss is applied for the first time, or a new one is being worn, the child should be kept much in the recumbent position, so that the pad may have the opportunity of settling down well to its work. Sometimes the pad is so small and conical as to press into, and even keep open, the abdominal aperture, and, as a rule, the spring is much stronger than necessary. If, except under pressure, the hernia be constantly down, the truss must be worn continuously, night and day ; but

if it come down only on exertion, it need not be worn when the child is in bed, though it must be readjusted before he gets out of bed. The skin beneath it should be carefully washed and dried, and dusted with violet powder at least twice every day. If any excoriation appear, the truss must be taken off, and the child sent to bed until the place is quite well again.

In the choice and application of a truss too much should not be left to the instrument maker. He views the matter from a purely mechanical standpoint, and he rarely has anatomical or surgical knowledge to enlighten him. Often, when the hernia is associated with a hydrocele, the steady pressure of a truss may cure both; but if fluid interfere with the pad, it may be withdrawn before the truss is applied, care being taken that no bowel is in the sac.

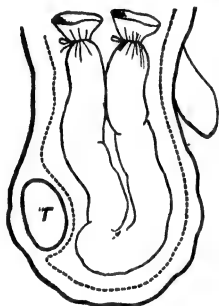


Fig. 56.—Congenital Hernia.

T, Testis.

Congenital hernia is that variety in which the bowel passes along the open funicular process and down into the tunica vaginalis. (See remarks on congenital hydrocele, page 355.) Though it is often found at, or soon after birth, its appearance may be delayed for weeks, months, or even years. Frequently it exists with congenital hydrocele, when, on the bowel being returned into the abdomen, the serous fluid can be made to follow it by raising the scrotum. Sometimes the bowel descends only a short way down the funicular process, when, if there be no hydrocele, it may be impossible to recognise the exact variety of the hernia, a matter of but little practical importance.

Congenital hernia may occur in girls as well as in boys; in the former the intestine drops into the

funicular process, which passes down with the round ligament—the canal of Nuck. In one child, sent me by Dr. Barlow, the ovary had thus descended as a hernia on each side of the body. Most of these cases will get well of themselves if the child be properly cared for, but, if expedient, a truss may be applied.

Except in the case of the truant ovary, nothing but small intestine is likely to be present in a hernial sac, for in childhood the omentum but thinly shadows forth its future greatness. On account of the loose connections of the lengthy mesocolon, the cæcum or the sigmoid flexure may, however, have descended.

Cæcal hernia occurs in the right inguinal region, and usually has, though not always, a complete sac. The tumour is large, and reduced with difficulty; yet it rarely becomes strangulated, perhaps on account of the large size of the abdominal aperture. Sometimes the vermiform process can be felt through the scrotal covering; but the exact nature of the protrusion may be detected only on operating for the radical cure; and, on account of this hernia being often unmanageable, it is very apt to call for radical treatment.

In **funicular hernia** the bowel has descended along the open tube of peritoneum, but on account of obliteration of the process having already taken place just above the testicle, it has not, as in the congenital variety, passed into the tunica vaginalis. This is a common variety of hernia in infancy.

Infantile, or encysted hernia, is of rare occurrence; its exact nature could hardly be recognised, except on operating. The tubular prolongation of peritoneum has been obliterated at the internal abdominal ring, whilst the tunica vaginalis and the funicular portion remain in free communication; an expulsive effort drives the bowel in a special sac,

and into the open funicular process and tunica vaginalis. (See Lockwood, Trans. Soc. Med. Chir. 1886.)

Case.—A weakly male child had a small, tightly-strangulated hernia of the left side; it reached half way to the testis. The child was very ill; the hernia could not be reduced under chloroform. A diagnosis was made of "congenital hernia," but, on opening the sac, a second sac was seen; at the bottom of the opened sac lay the testicle. After a slight use of the hernia knife, at the top of the tunica vaginalis, the

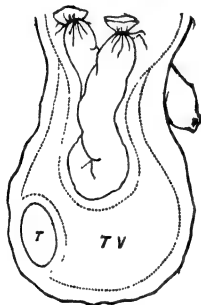


Fig. 57.—Encysted Hernia.

T, Testis; TV, tunica vaginalis.

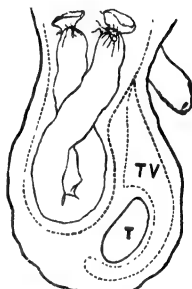


Fig. 58.—Hernia behind the T, Testis; TV, tunica vaginalis.

contents of the small sac were returned without being exposed. On the eighth day death occurred from pneumonia; the preparation is in the museum of St. Mary's Hospital (No. C. d. 20). (Fig. 57.)

There is a **second variety of infantile hernia** in which, the funicular process being closed at the abdominal end, but opening into the tunica vaginalis, a piece of intestine passes down, in a sac, behind the tunica vaginalis, instead of into it. It would be necessary to cut through three layers of peritoneum before reaching the bowel (Fig. 58).

Radical treatment of reducible hernia is a preferable term to "radical cure." It is by no means always a cure, and so to speak of the operation is to surround it with a specious attractiveness. A little boy was seen a short time since, in whose case the "radical treatment" had been followed with a result that was simply appalling; the protrusion could hardly have been worse before the operation than it was after it.

As a means of hurrying on the obliteration of a reducible hernia, it has been suggested that a small amount of alcohol be injected by a subcutaneous syringe around the external abdominal ring, with the view of causing thickening and subsequent contraction of the connective tissue. A solution of oak bark has been similarly used; but as the injection may require many repetitions at short intervals (the child being kept in bed during the progress of the treatment), and as there is a considerable risk of the fluid being injected within the peritoneal cavity, it is not likely that the method will receive extensive adoption. Still, it may prove of value in connection with treatment by the truss. To diminish the risk of peritonitis, Keetley first makes an incision down to the canal before injecting; but having called in the aid of the scalpel, it would probably be more efficacious to proceed a step farther in the treatment, and occlude the neck of the sac and the inguinal canal in the more business-like way.

The operation of radical treatment is rarely advisable before the seventh year, as the continuous wearing of a well-adjusted truss may be expected to effect great improvement in the growing child. Before operating, the contents of the sac should be returned, and the skin cleansed with an antiseptic solution. Instruments, fingers, sponges, and everything else, should be clean beyond suspicion.

A free incision is made along the front of the cord, until the funicular process is reached. The coverings are disturbed as little as possible during the dissection. The serous process is freed, the vas deferens and the spermatic vessels being jealously protected from injury. The process is securely tied by a catgut ligature, close against the general peritoneal cavity, so that no depression may remain upon the abdominal aspect likely to encourage subsequent emigration of bowel. To effect this it may be necessary to lay open the whole extent of the inguinal canal. Just below this ligature the funicular part of the sac should be severed.

There is a difference in practice as regards the treatment of the sac ; some surgeons remove it almost entirely, leaving only enough to form, perchance, an improved tunica vaginalis, whilst others are content with tying the neck high up and dividing it below the ligature. When we consider the success which attended Wood's operation, in which the sac is dealt with neither by knife nor special ligation, attention being directed to deeply suturing the walls of the inguinal canal, the inference is that ligature of the neck, flush with the peritoneal cavity, should suffice. Excision of the sac is well described as a "mauling" operation, and the local and general disturbance entailed thereby may prove extremely disastrous ; certain it is that the excision is unnecessary. Other surgeons there are, who, having divided the funicular process, twist it up on its long axis, and with it block the lower end of the inguinal canal, suturing the ring. And, lastly, there are others who affirm that so long as the funicular process is obliterated high up, the inguinal canal needs no suturing. This may be so ; but in the meanwhile I prefer the high ligature of the process, and the lacing of the canal. The walls of the inguinal canal as well as the pillars of the external abdominal ring are approximated by several sutures of

strong silver wire, twisted up tight and cut close. They are to be left permanently in the tissue; and so that they may have a firm hold upon the aponeurosis of the external oblique, they should be inserted at some distance from the margin of the ring. The edges of the skin-wound are sutured with carbolised gut, and the part is covered with a pad of iodoform wool, due provision having been made for drainage.

I would urge that in the after-treatment of a radical operation no truss be applied. If the operation has been efficiently performed, the pad is not wanted, whilst its pressure may be actually harmful by promoting the absorption of the plastic deposit needed for blocking the canal. Within a few weeks of the operation I have the child up and about, so as to test the value of the procedure. In one case I had to operate a second time before the protrusion was permanently effaced.

If the **testicle and bowel be adherent** in a case of reducible inguinal hernia, the subject may be highly suitable for the radical treatment. Prolonged and assiduous endeavour should first be made to coax down the testis and imprison the bowel, but the complication is an unsatisfactory one for the adoption of conservative principles. If, in the performance of the operation on such a hernia, the testicle be found fully developed and easily separable, it may be brought down and left in the scrotum. But if translation do not suggest itself, or seem impracticable, or the gland be undeveloped or of doubtful firmness, it had better be removed. The operation is likely to be attended with complete success, for the testicle being removed, the whole of the peritoneal process and all the constituents of the cord are taken away with it; and, nothing remaining to occupy the inguinal canal, the external abdominal ring can be completely and permanently closed.

Appreciation.—Many cases of reducible hernia, which have defied years of treatment by truss, have yielded at once after the cutting operation; but children must not be subjected to it without having been first submitted to a full and sufficient trial by truss.

Statistics are apt to be fallacious; and though a large array of figures may show an excellent success for the operation (imperfect results or failures may somehow have escaped due recognition), many reports may have been hurried into publicity before the subject had been allowed the test of time. This is unfortunate and misleading.

The "bag and baggage" policy alluded to under the heading of the adherent testis and hernia is specially a matter for consideration and report. I must admit, without prejudice, that I am inclined to regard it favourably; an undescended testis is a cause of constant anxiety to the parent, and it will be one of future annoyance to the subject, if, as often happens, it fail to complete its descent; moreover, its physiological value may be a matter of doubt.

If death follow the operation of radical treatment of hernia, it may be due to peritonitis, or blood-poisoning; and though the chances of that contingency are small in clean and careful surgery, still, whatever the special treatment adopted, the occurrence is well within the range of possibility. If this fact be constantly kept in view, due attention will be paid to the simpler treatment, the knife and sutures being reserved for those cases which are otherwise unmanageable. Thus the radical treatment will settle quietly down to its proper therapeutic level.

Without doubt there is danger in connection with the operation; but against this must be reckoned the lifelong risks of strangulation, and its associations which the patient must run if his hernia be not cured.

As regards the variety of suture employed for blocking the ring, it does not seem to matter; nor as to whether the peritoneal end of the congenital sac be occluded by torsion or by ligature. In the case of a hernia into the tunica vaginalis, it is not advisable to dissect the sac away from the cord; in so doing there is a risk of tearing up or damaging the vas deferens, and of interfering with the due development of the testis. As a last word, I would like once more to insist that no child with a reducible hernia should be subjected to the risk of a radical operation until a full and fair trial has been made of treatment by trusses.

Spanton's method of performing the "radical cure" subcutaneously may be found described in the Transactions of the International Medical Congress for 1881. By means of an instrument something like a cork-screw, which he introduces through the tissues of the inguinal canal, he effects a permanent blocking. The screw is left in position for a week or more. Spanton is of opinion that in the hands of himself and others the operation must have been performed upwards of a hundred times, and without the record of a fatal result. In cases in which it has failed to effect a cure the condition of the patient has been rendered no worse by the procedure.

A grave objection to the method is that the surgeon is working in the dark, and that there is considerable risk of some of the constituents of the cord being entangled by the instrument. It can, of course, be employed only when the hernia is entirely reducible.

Inguinal hernia is rarely **strangulated**; this fact may be due to the tissues at the neck of the sac being soft and readily yielding.

When a hernia cannot be returned, the child should be at once placed upon its back, the pelvis

raised upon a pillow, and the knees tied up under the roof of a cradle, so that the blood may be encouraged to drain away from the congested piece of bowel, a little ice in a bladder being suspended over the tumour; the child should be allowed nothing but ice by the mouth, or iced water. A few hours of this treatment generally suffices to secure the spontaneous return of the bowel. But if sickness and constitutional disturbance increase, in spite of the treatment, chloroform should be administered and one deliberate attempt by taxis undertaken, with the understanding that if this fail a cutting operation must be then performed. No doubt, the child is in danger so long as the hernia is imprisoned, and needless delay must be avoided; but I would draw attention to the fact that if the treatment suggested above be fully carried out, operation is rarely needed. In this respect the case differs widely from that of the adult.

It surely is unadvisable that the child be put into a hot bath, for thus time is lost, and nothing gained but that which can be far better obtained by the employment of an anæsthetic. The use of the hot bath implies more taxis and, perhaps, bruising of the bowel.

Herniotomy in childhood does not differ from the operation in the adult, and most likely the sac will be opened for the relief of the stricture in each case; this is due to the thinness of the wall, and to the fact of strangulation most likely existing in the neck of the sac which was in progress for obliteration. Indeed, the surgeon would advisedly open the peritoneum, and the bowel being returned, the sac and the inguinal canal would be dealt with as described in the radical operation (page 369).

Mr. Robinson, of Guernsey, has reported the case of a male infant, of fourteen days, on whom he successfully operated for a strangulated inguinal hernia.

Femoral hernia is seldom met with, probably

because the pelvis not yet having taken on growth, there is sufficient resistance in the tissues filling up the space below Poupart's ligament. A reducible hernia must be treated on those principles which guide us in dealing with an inguinal hernia.

Case.—Laura G., six years, was brought to the Hospital for Sick Children, for a tumour the size of a small walnut just below Poupart's ligament of the right side. The skin over the swelling was red and slightly oedematous. The child's general condition was evidently extremely grave, and highly suggestive of enteric fever; sordes covered the lips and teeth, the tongue was furred in the middle and red at the tip and edges. Under chloroform, one brief trial of taxis having proved unsuccessful, an incision was made over the tumour, and, the sac having been opened, a knuckle of small intestine was found, dusky and oedematous from a tight strangulation of about forty-eight hours. A slight incision having been made at the femoral ring, the bowel was returned, and the thin piece of peritoneum which had played the part of the sac was stuffed in to block the aperture in the crural sheath; a drainage tube and a few sutures were used; the wound was dressed with dry lint; the patient made a complete recovery.

CHAPTER XXV.

LATERAL CURVATURE OF THE SPINE.

LATERAL curvature of the spine (scoliosis) is not a disease; it is a local expression of general enfeeblement. It is often found in the subjects of flat feet; and, like flat foot, is due primarily to a yielding of muscles and ligaments under superimposed

pressure. It is found chiefly in girls who are physically weak, or in whom growth has advanced beyond strength and solidity. Such girls have often fallen into lolling habits when standing, or when sitting at meals, at the pianoforte, or at lessons. Boys are but little liable to the deformity, as they possess greater physical strength and keep their muscles and



Fig. 59.—Lateral Curvature in a Rickety Child.

other tissues in a state of efficiency by out-door exercises. The children of the poor are much less affected with lateral curvature than are those of the upper classes, who take but little exercise, and pass much of their time sitting.

Attention may first be called to the condition by the mother noticing that a hip or shoulder is "growing out"; but as the child makes no complaint, surgical advice may not be sought until the deformity is but little amenable to treatment. In the early weeks of the deviation

there is simply a yielding of feeble muscles and ligaments; but, later on, when the vicious habit is confirmed, the intervertebral discs and the bones become misshapen, and a peculiar rotation is produced.

Before the bones are affected, the curvature is amenable to treatment; afterwards it is incurable. But even then further deformity may be prevented and relief afforded by the adoption of appropriate measures.

In either sex lateral curvature may be secondary to collapse of lung tissue (page 156), or to obliquity of

the pelvis from congenital dislocation of a femur, or some other form of shortening of a lower extremity. Instances are met with in which the curvature has been induced in a child by carrying about a baby; weakly girls should never be allowed to nurse heavy infants. Sometimes the curvature comes on after illness. The chief of the early symptoms are "back-ache," lassitude, and lolling and stooping, especially if a walk have been long or lessons fatiguing.

As a rule, the lateral deviation shows itself most markedly in the dorsal region, the convexity of the curve being directed towards the right, so that the scapula of that side is raised and prominent. Sometimes the angle of that bone is raised several inches from its proper position. An alternating curve is sometimes found in the loins; indeed, this latter must be considered the primary one, that in the dorsal region having been needed to keep the centre of gravity within the base of support, when the child is standing. Sometimes a curvature exists also in the neck; this, like the lumbar curve, having its convexity towards the left.

A growing and weakly girl, standing much in class, finds that she can spare herself muscular fatigue by throwing her weight on her right foot, keeping the knee firmly extended, and advancing the left foot, and slightly flexing the knee of that side. Thus she falls into the "stand-at-ease" position of the soldier. Deprived of its support, the left side of the pelvis then drops, and the strain of keeping the body erect falls upon the right ilio-tibial band of fascia lata, the capsular ligaments of the hip joint, and the articular processes of the vertebræ—tissues which are unconscious of fatigue. With a dropping of the left side of the pelvis, the centre of gravity of the trunk is displaced to the left unless the upper part of the body be brought across the middle line. Thus, the

inclination of the lumbar spine towards the left only is explained ; but if the pelvis be squared again, as happens when the girl is in the sitting posture, the upper part of the trunk would be inclined so much to the right that unstable equilibrium would be produced ; the spine has then to be brought over again towards the left, and thus the dorsal curvature, convex to the right side, and the "growing out" of the right shoulder, are produced. The hip bone of that side is apparently "growing out" also ; because by the inclination of the lumbar vertebræ to the left, the soft parts of the flank are carried away from over the right iliac crest ; at the same time the left hip bone is hardly distinguishable, being hidden under the deflected vertebræ.

The child who sits badly at school, on account, it may be, of faulty arrangement of form or desk, or because of defective sight or of imperfect lighting, is apt to throw the chief part of her weight upon the left ischial tuberosity, and then, with the left hand upon the table and the elbow hanging at the side, and with the right elbow resting upon the table, the right shoulder is kept constantly raised and the loin region of the column inclined towards the left. This is the way in which many a case of lateral curvature begins * and is perpetuated.

Alexander Shaw remarks that the characteristic affection may be looked for at about ten or fourteen years of age, and that its progress, which is at first rapid, becomes slower as the vertebræ consolidate ; and that at about seventeen it may be said to have arrived at its last stage. It is then neither disposed to advance nor capable of being amended by treatment.

With the lateral deviation of the column the weight is unevenly distributed upon the surfaces of

* See two Lectures by Liebreich.

the osseous and cartilaginous elements, so that that side of the body of the vertebræ which is directed to the concavity, and the corresponding articular processes, undergo diminution. The body of the vertebra being squeezed, as it were, from out of the region of excessive pressure, the tip of the spinous process is twisted into the concavity of the curve, the whole vertebra undergoing a rotation on its vertical axis. When, therefore, the line of the spinous processes is dotted out with ink upon the naked back, the track represents only approximately the extent of the curvature, the bodies of the vertebræ being much more deflected from their normal site than one would be led to infer. The vertebræ may be so much rotated that the transverse processes are directed backwards.

For **examining the patient** the clothes should be removed down to the level of the hips ; she should then bend forward over a chair, and the line of the spinous processes should be traced out from occiput to sacrum. Being then partially dressed, the girl should be placed on her back on a firm couch, and the pelvis having been brought flat and square, it must be seen whether the legs are of the same length, for a slight inequality may cause a tilting of the pelvis and the deflection of the lumbar spine. Such inequality may be congenital, or the result of infantile paralysis. Lateral curvature may be left after hip-joint disease ; or after any other condition which prevents the patient evenly supporting the pelvis.

As a **result of lateral curvature** the chest and trunk may be greatly deformed ; on the concave side the ribs will be crowded together, whilst on the other they are widely spread out ; and from the rotation of the vertebræ, the angles of the ribs on the convex side will be pulled far back and rendered more acute, as shown in the accompanying scheme. But great as the thoracic deformity may be, on account of the

gradual and quiet manner in which it has been induced, the heart and lungs will have accommodated themselves to the situation without material inconvenience. Roth* remarks, that at the first examination it is essential to ascertain to what extent the spine can be restored to its normal position by a voluntary effort on the part of the patient, and a little help from the surgeon. The symmetry of the trunk may be improved by the holding up or out of one arm ;

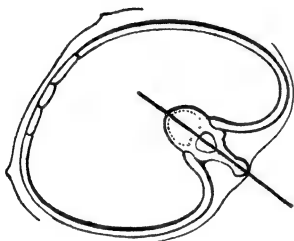


Fig. 60.—Section of Chest, showing Deformity consequent on Lateral Curvature. (After Shaw.)

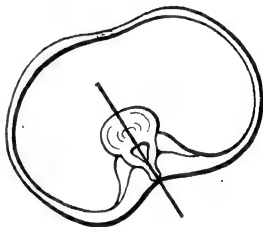


Fig. 61.—Section through Loins. (After Shaw.)

whilst sometimes the best result can be obtained by raising both arms over the head. This exact position of the trunk and arms for effecting the greatest temporary improvement in the spine is the "key-note" of the exercises to be practised. By carefully planned exercises, regularly and efficiently carried out, the most favourable result is to be obtained.

It is, as already remarked, only in the early stages of lateral curvature that treatment can have a beneficial effect. Neither exercises nor supports of any sort can untwist the rotation of the spine, nor restore the original form to vertebræ which have been moulded by irregular pressure.

* Consult his article in Heath's Surgical Dictionary.

Treatment.—The spinal muscles should be so strengthened by exercise that the patient may be able to sustain the improved position without great fatigue. At first she may be able to maintain it only for a few seconds, but strength comes with exercise of the muscles. The thorax should be developed by systematic breathing, and by methodical exercises acting directly upon the ribs. Gymnastics, and exercises generally which do not bring on fatigue, are to be recommended. Boys are so rarely the subjects of lateral curvature, chiefly because in their games they use all their muscles, and do not sit cramped over music or needlework, nor, as a rule, too much over books, as girls are apt to do. Swinging by the hands from a horizontal bar, firmly fixed by staples and cord from the top of a doorway, is a good exercise. It gives the intervertebral disc the chance of re-expansion, strengthens the scapular muscles, and probably helps in undoing some rotation of the vertebræ. After the exercises the patient should again place herself squarely in a reclining chair; she should not stand about. She should not be allowed to cross the thighs when sitting, as this act tilts the pelvis; standing on one leg is also harmful.

Though the principle of treating lateral curvature in children by means of stays, jackets, and supports of all kinds, is generally disadvantageous; still it must be admitted that there are instances in which the adoption of mechanical support is necessary. Such are the cases in which the affection has been allowed to proceed untreated or unchecked; rotation and deformity are extreme, alterations in the shape of the vertebræ permanent, and the patient has not sufficient power of muscle to assume even a slightly improved position. Such unfortunate cases are absolutely incurable, though the comfort of the patient, and the powers of locomotion and digestion, may be improved by the

application of a poroplastic felt jacket whilst the patient is suspended. These cases are, however, rarely to be met with in the surgery of childhood.

Parents are often anxious to hear that some support is to be ordered ; sometimes, indeed, they go to a shop and buy one for themselves, either without, or contrary to, the advice of the medical attendant. If the scoliotic child were not the victim of this craze for "spinal supports," one might almost say that the disappointment entailed was well merited. Oftentimes these ingenious and complicated machines are ordered and paid for when their use is positively harmful. This, perhaps, may be asserted, that sometimes those who prescribe seem to ignore the fact that the parents who have to pay for the apparatus may be little able to afford it. The primary cost is, to say nothing of secondary charges, absolutely astonishing. Having exhausted their means in the delusive hope of thus benefiting a feeble child, parents are compelled to apply for hospital relief ; they bring the child *with*, but not wearing, the cumbrous apparatus, which has been already found useless. The skin may have been chafed by its wear in more places than one, and it may have caused extensive ulcers, or painful excoriations.

Too much responsibility is often thrown into the hands of the instrument maker, and sometimes the tradesman himself, acting quite independently, prescribes and fits an instrument. To him lateral curvature and angular deformity of the spine are often the same thing ; at least, they need the same treatment, an expensive spinal support. Spinal supports of every kind are usually not only ineffectual in the treatment of lateral curvature, but absolutely prejudicial. They contain a weight of metal which exerts its influence chiefly in tiring the child, and in helping to crumple up the pliable pelvic bones.

The child with lateral curvature should not be kept

too much in the horizontal position, as this increases the enfeeblement of the spinal muscles. She must not be kept a prisoner to the house, nor must her chest be caged in felt or gypsum. She should be dressed in flannel, but not overweighted with clothes, and as the circulation is often feeble, the legs and arms should be well covered. None of the clothes should be tight; "hygienic braces" and all apparatus of that sort, with which these children are sometimes supplied, should be discarded. A cold bath should not be allowed, except in the height of summer, but douchings with warm and cold water, and shampoos along the muscles of the spine, may be persistently carried out night and morning. Beyond all this, the lungs must be exercised, and the ribs and respiratory muscles brought into play by slow, deep inspirations by the nose, and expiration by the mouth.

Another exercise is by fixing the patient prone, with the whole of the trunk, upwards from the level of the iliac crests, projecting beyond the end of the couch; the shoulders are allowed to sink towards the ground, and then, by calling into action the masses of the erector spinæ, the shoulders are raised even above the level of the rest of the body. This exercise may be gone through several times in the day; but at the beginning of the treatment it cannot be often repeated on a single occasion. Several firm longitudinal strokings of the patient's back by the attendant's two palms generally remove any aching caused by the exercises. These strokings are also usefully employed at home to relieve backache. After each exercise the patient rests a few minutes. Several of the simpler exercises have to be practised at home for about fifteen minutes twice daily.

When not walking about in the open air, or employed at gymnastic exercises, the patient should be sitting in a chair with a high, sloping back, with the

sacrum, as well as the scapulæ, against the chair-back, in order that the sitting posture may be kept up without a relapse into the vicious position. She should be made to see the importance of, and interest herself in, maintaining the correct posture when standing as well as when sitting, and in order that she may herself correct error and watch for improvement, she may practise before a good-sized looking-glass. The ordinary music stool must be discarded, and in its place she should have a high chair with a back, which should be drawn close up to the piano, so that she may avail herself of the support of the back of the chair.

A serviceable and cheap reclining chair may be obtained at an outfitting or furnishing warehouse. It is the cane chair with a sloping back, such as is often used on the deck of the large passenger ships. But if no reclining chair or couch is at hand, the child should be made to lie prone on the hearth-rug or by the window; and in this way, with the chin supported on the hands, she may spend several hours daily reading or looking at pictures.

The patient should go to bed early, and should not work at lessons or music before breakfast. The bed should have a firm mattress and a flat pillow. A very useful seat can be obtained by cutting a few inches off the hind legs of a common Windsor chair which has vertical rails up the back. If, after this, it appear unsteady as the child thoroughly supports herself in it, it may be kept ~~with~~ its back standing against the wall.

If the lateral curvature be secondary to a tilting of the pelvis from an inequality in the length of the limbs, the iliac crests should be brought to the same level, by increasing the thickness of the sole of the boot on the affected side. Such elevation should be gradual, so that the spinal column may have time to

arrange its elements in accordance with the changed conditions.

The meals should be plain, and taken at regular intervals. Cakes and sweetstuff cloy the appetite ; stimulants will not be needed. The laxative iron mixture, or that of cod-liver oil and iron, or the simple tincture of iron in water, may be prescribed. If continued supervision be given, even an unsightly curvature may be expected to cease to increase, so that later on, by an artful arrangement of corset and dress, the deformity is hardly to be detected even by the critical eye.

Before pronouncing a child cured of or free from curvature, she should be kept standing for several minutes, until the muscles are weary of holding the spine erect. A curvature which can be detected only in this way is, of course, very slight.



Fig. 62. — Antero-posterior Curvature from Rickets.

The **rickety curvature** is evenly distributed from the neck to the loins, the head falling helplessly on to the chest, or down towards the child's knees. This condition has been dignified by the name **cyphosis** (*κύφος*, "bowed forwards"). There is no difficulty in recognising the bowing, as it co-exists with extreme rickets or general physical debility from other cause. The curvature is, at a glance, altogether different from that of caries, whilst the abnormal mobility of the spine gives evidence of the absence of inflammatory disease. If the child be put flat on the table, or laid prone across the surgeon's knees, the knees being gradually drawn apart so as to stretch the child's trunk, the spine comes as straight as ever.

Weak and growing girls are particularly apt to develop this hoop curvature, especially if they be the subjects of near-sightedness, because they have constantly to lean forward to read, or even to see the

food on the plate. Both shoulders are said to be "growing out," the explanation being that the shoulder-blades cannot lie flat upon the rounded back.

Treatment.—If the subject be an infant, careful feeding and clothing, and the administration of cod-liver oil by the mouth or skin, and the maintenance of the horizontal position, will be needed. No support of any kind is required. If the child be a few years old he should take his meals as he lies on the floor, or if he be allowed to sit at table he should be made to lean back in his chair. Lolling over plate, picture book, or toy should be prevented. For the growing girl, the treatment will be that prescribed upon page 381; and care must be taken that if the eyes be weak she be supplied with glasses which have been selected by one skilled in ophthalmic surgery, and not merely picked out by the tradesman, whose business should be to sell rather than to select. At lessons she must be made to sit as directed in a previous part of this chapter. She should not, for a time at least, be allowed to continue music lessons.

Neuro-mimetic (hysterical) affections of the spine are met with in growing girls; occasionally nearly all the signs of vertebral caries are detailed whilst the skin is found marvellously hyperæsthetic. Fortunately (page 172), these nervous symptoms are generally so exaggerated that the nature of the disease is promptly detected. The pain and tenderness are generally *in the skin*, the child complaining when, if her attention be directed to the part, the skin is gently pinched; stiffness of the spine is conspicuous by its absence (page 256).

Treatment.—Such a child will require change of air and scene, and possibly some studious habit should be given up, and more exercise in the open air insisted upon. A course of iron and quinine; early hours, and social and domestic quiet, will be requisite.

CHAPTER XXVI.

PERIOSTEUM AND BONE.

THE diagnosis of **acute periostitis** is often obscure for a time, and the disease is thus allowed to make considerable headway before its exact nature is recognised. That for which it is most often taken is **acute rheumatism**. The attack comes on with great suddenness. The anxious mother puts the child to bed, wraps the limb in flannel or surrounds it with fomentations, and tells the doctor that the child has "**rheumatism**." Her mistake is as natural as it is pardonable. The doctor having heard of the suddenness of the attack, and finding the limb hot and painful, and the skin perhaps already congested and tender; and discovering probably that the child's temperature is several degrees above 100° Fahr., accepts the diagnosis thus suggested to him, and prescribes a course of salicylic acid, or of some potash salt. But as, after several full doses, the temperature does not descend, nor the distress diminish, suspicions are aroused, and on the practitioner examining the limb he finds great thickening about the diaphysis of the bone, whilst the epiphyses and the articular surfaces are unaffected. Had the case been one of acute articular rheumatism, the swelling would have been at the joint, and not in the shaft of the bone. Nevertheless, this very grave error in diagnosis is constantly being made.

The history of the beginning of many of these cases is just that of acute rheumatism. Thus, a boy has been going about in wet or snowy weather, and his boots and trousers have been constantly damp; or a child gets soaked through on her way to school, and sits in her wet clothes, and so on. In another

unhealthy, ill-clothed child, the cold east wind may be made accountable for the attack.

Pathology.—The inflammatory changes probably begin in the deeper layer of the periosteum, the subjacent bone being unimplicated. Possibly they are started by the deposit in the weakened periosteum of certain germs from the infected blood: the rapidity with which pneumonia and other septic complications supervene support this theory. Effusion takes place rapidly, so that by the increasing collection of pus, serum, and blood, the periosteum is literally stripped from the length and circumference of the diaphysis.

It is unusual for the inflammation to extend into the articulation, because the epiphysial cartilage acts as a barrier between the circulation of the shaft and that of the epiphyses, yet the inflammation may advance along the fibres of the capsule. In the case of inflammation of the upper part of the shaft of the femur, however, the hip joint is likely to be implicated, because the diaphysis extends within the capsule.

For a long while the tough layer of the periosteum prevents the escape of the pus towards the surface of the limb, and, during an unfortunate delay, the slender vessels which are passing into the compact tissue are stretched and torn, and the risk of acute necrosis is rendered extreme. The disease is thus sometimes called *acute necrosis*, a term which suggests as a separate pathological entity what is but the effect of disease. If a young practitioner become impressed with the existence of such a fierce disease as “acute necrosis,” he may rashly conclude that bare bone discovered in a subperiosteal abscess is in need of immediate resection.

About the tenth day of the disease, sometimes earlier, fluctuation may be detected; diarrhœa and delirium may come on, and the child may sink from exhaustion, pneumonia, pleurisy, or pyæmic suppuration.

Acute periostitis does not necessarily end in supuration; under appropriate treatment in a healthy child, resolution may occur, and the effects of the disturbance quickly pass off. Occasionally the attack degenerates into a chronic periostitis and osteitis, but the milder form of the inflammation is usually chronic from the beginning; the conditions of acute and chronic inflammation being clinically distinct.

The **symptoms** of acute periostitis are heat, swelling, tension, and discoloration; first the skin is reddish, and then of almost a red-brown colour. If the bone be deeply placed (femur and humerus), discoloration of the skin may be late in appearing, whilst over the shin it comes on quickly. By gently grasping the bone between the finger and thumb, and making a comparison with the other side, a deep-seated swelling is made out; the tenderness is excessive. Oedema of the limb steadily increases, and the neighbouring joints may become swollen and painful. The fever is high, and shiverings, or even convulsions, may occur; exhaustion and sleeplessness are great; appetite is gone, and thirst is extreme.

Case 1.—A girl was admitted to St. Mary's Hospital, April 13th, 1883. She had been treated for acute rheumatism of hip joint. Both parents were rheumatic. The face was flushed; temperature 103.3° ; delirium at night. The top of the thigh was swollen and fixed. Salicylic acid and leeches had had no permanent effect; there was central thickening and tenderness at upper end of thigh. There were signs of septicæmia. Exploration, after Hilton's method (page 115), procured evacuation of a large subperiosteal abscess.

Case 2.—A boy of six went to bed quite well, and next morning could not put his right foot to the ground; the leg swelled rapidly, and was supposed to be the seat of acute rheumatism. On the Sunday following

(two days later) he vomited, and was hot, thirsty, and very ill. The leg was red, shining, and tender. Under chloroform, an incision was made down the front of the tibia, thick pus escaping; the entire diaphysis was stripped bare by subperiosteal suppuration; a bent probe could be passed around the diaphysis. Counter-openings were made in upper part of leg, and by the internal malleolus. The bone was quite white, like ivory, but as it was firmly connected with its epiphyses it was given the chance of becoming again clothed with its periosteum. The cavity was washed with iodine water, and the limb surrounded with salicylic wool, subjected to gentle compression, and raised upon a pillow.

Next day the temperature was 99.8° , pulse 136; the wound gaped and discharged freely. Within a week the bone looked pink in places, the granulations being florid; the periosteum was becoming again adherent; the discharge was slight, and the temperature almost normal. Recovery was eventually completed without loss of bone and without periosteal thickening.

Treatment.—When the child is anæsthetised, examination may be begun, and a free incision should be made down to the bone, the limb having been first washed with an antiseptic solution. Es-march's bandage should not be used, lest further extravasation of pus occur. If the shaft be tried and be found firmly connected to the epiphysis at both ends, every chance should be afforded it of re-clothing itself with periosteum; but if it become detached at either junction cartilage, it should be lifted out. If it be decided to leave the diaphysis, a clean probe should be passed along the space beneath the periosteum, and the most dependent part selected for the introduction of a drainage tube. Warm solution of boracic acid, carbolic acid (1 in 40), or corrosive

sublimatè (1 in 4000), should be freely used with a large glass syringe or an irrigator. The drainage openings must be made low down; it is unsatisfactory to have to squeeze fluids upwards on the occasion of each dressing. The dressings may consist of iodoform or salicylic wool, or of wood-wool or carbolised tow in gauze bags. The limb should be gently compressed by a soft roller and elevated.

Opium, quinine, and iron will be required; and wine, eggs, milk, and fresh meat will be important elements in the diet.

On the following day the dressing should be renewed, and for this occasion at least, chloroform may be again administered; the drainage tubes may be changed for others of smaller calibre. The subsequent dressings must be performed as occasion may direct, but the wounds must be kept sweet, if necessary by frequent irrigations with warm antiseptic solutions.

Attention must be specially directed to the fact that the entire diaphysis may be stripped bare by subperiosteal suppuration, without necrosis necessarily following; free escape having been provided for the matter, and the child being strong, the periosteum may gradually adhere once more to the bone. Thus, it would seem that the diaphysis obtains a serviceable supply of blood through the active vessels of the epiphysial cartilages.

If, in spite of watchful care, the child do not improve; if the temperature keep high, and the pulse become small and quick; if the appetite fail and the child grow pale and exhausted, either the diaphysis must be resected or the limb amputated.

It is quite likely that the child will be in a pyæmic condition before heroic treatment has been attempted, or even before the existence of abscess has been recognised; there may be convulsions, profuse perspirations, and sickness. Amputation would then

be required ; so also, perhaps, if the articulation be invaded. Convalescence, except after amputation, is sure to be prolonged, and it is likely to be still further retarded by the occurrence of metastatic abscesses.

Billroth has suggested that incisions be not made until fluctuation is distinct and the skin thinned. He is opposed to the practice of cutting down to the bone through a stiff-walled abscess. I would, however, with all deference, advise that incision be made down to the bone as soon as the nature of the disease is suspected. In these desperate cases the sooner that tension and engorgement are relieved the less the risk of necrosis and pyæmia ; fluctuation must not be waited for, but the co-existence of swelling and tenderness about the bone, and of severe constitutional disturbance, is to be taken as indication for the speculative employment of scalpel and director. Timidity and delay are likely to be followed by the most disastrous results, whilst an exploration which is conducted with care and cleanliness is not in itself dangerous. (Periostitis in the upper end of the femur is apt to be mistaken for hip-joint disease ; page 431.)

Acute periostitis may be associated with **inflammation of bone and medulla : osteo-myelitis**. It may be impossible to differentiate this from acute periostitis. In each case there are the urgent symptoms. The limb is swollen, the skin tense and shiny, perhaps red ; the limb lies at rest, and the least movement causes pain. There is the deep-seated swelling of the shaft. Acute inflammation of the bone often runs hand in hand with that of the periosteum.

Treatment.—In the early days, or rather hours, of the disease (for the course is very rapid), leeches may be employed and the limb surrounded by flannels wrung out in warm water, and applied under oil-silk.

The limb should be secured on a splint, and raised on a pillow. Morphia may be administered. Several incisions may be made down into the inflamed bone. Under active treatment recovery may take place, but it is probable that amputation will be eventually demanded as high above the inflamed bone as practicable. The complications may be acute necrosis, pyæmia, and septic pneumonia.

Central necrosis in the shaft of a bone may be the cause of persistent enlargement and pain; the appearances may be very much like those of chronic osteo-myelitis, especially if the acute inflammation of the bone which determined the necrosis have been followed by deep thickening. A free incision into the shaft will reveal the exact nature of affairs, and may obviate recourse to the grave measure of amputation. Possibly a sequestrum may be removed, or an abscess opened by the operation.

Another kind of central necrosis is that in which a sequestrum is quietly isolated in the cancellous tissue of the joint-end of a long bone, or a vertebra. In the former case the bone swells, and unless the sequestrum be removed the joint may be at last destroyed. When the disease is symmetrical, it may possibly be of syphilitic origin.

Fallacies.—Though sarcoma grows more quickly than an innocent tumour, it is often attended with pain, and it is sometimes difficult to differentiate between it and a chronic osteitis and periostitis. A large sequestrum, surrounded by an extensive formation of new bone, gives much resemblance to a sarcoma; the latter, however, is more likely to occupy the articular end, whilst necrosis attacks the diaphysis. The introduction of a grooved needle would show the sarcoma to be soft and succulent, whilst the inflammatory disease would be hard, or yield pus. The clinical history and symptoms are apt to be misleading, and

the surgeon will do well to hold his judgment in suspense until he has, under chloroform, thoroughly explored the tumour by an incision. (See case, page 122.)

In case of doubt, glandular enlargement should not be waited for, but exploratory incision undertaken. No time should be lost ; high amputation may offer the only chance of success. No partial operation for a sarcoma of a long bone, such as that of enucleation or scraping, should be attempted. Though in a few instances it might possibly succeed, in the generality of cases it would prove disappointing, and, therefore, disastrous. There should be no temporising with such a disease.

Amputation at the hip for malignant disease of the femur in childhood is not desperate if done early. It should be performed after the manner of Furneaux Jordan (page 457).

Chronic periostitis may be the result of wet, cold, or injury. It is most often met with in the strumous subject, and is generally associated with osteitis. The bones most frequently affected are the tibia, femur, and the metacarpal bones. A boy has recently been under treatment, who, some months previously, had knocked his leg whilst at play. He was made to lie up at home for a day or two, but, as he admitted, he was running about before the soreness had disappeared. There was thickening over the front of the tibia, and the spot was evidently tender. As always happens when a fibrous tissue is inflamed, the pain was worse at night, and when the days were wet and cold ; as also after exercise.

The **treatment** consisted in the application of two leeches ; in enclosing the limb in a plaster of Paris splinting ; and in aiding venous return by raising the limb on a pillow. Iodide of potassium and iron, and later on, cod-liver oil, were prescribed. Treatment

was thus carried out with thoroughness, and gave a satisfactory response.

Another strumous subject had chronic disease of the shaft of the metacarpal bone of the thumb; his brother was in hospital for hip-joint disease. The treatment was much like that sketched in the chapter on struma, absolute rest being secured for the affected bone. (The subject of dactylitis is treated of in chapter iv.)

Chronic diffuse osteitis is due to congenital syphilis, and is referred to in the chapter dealing with that disease (page 80).

Chronic osteo-myelitis may be a primary affection, or it may be secondary to disease of an articulation, an amputation-wound, or other injury to the bone. The femur and tibia are most likely to be affected. The symptoms are deep-seated thickening in the limb, with general enlargement of the bone; pain, tenderness, and constitutional disturbance.

Treatment.—The limb should be secured upon a splint, and raised. Tonics and anodynes will be required. If the child be losing strength, and the local trouble do not improve, exploration should be made under chloroform; if no further surgical procedure appear demanded, the wounds may be drained and compression of the limb resorted to. Liberal washings and dressings of corrosive sublimate, or other antiseptics, will be necessary.

But if after this the case give no promise of improvement, either amputation will be needed, or *scraping out the medulla*. This latter operation is described by Keetley.* Supposing that the femur be involved, a free incision is made along the outer side of the thigh, after the application of an Esmarch's bandage. The bone is opened up, and, if necessary, trephined, and the medullary cavity is scraped out

* "Annals of Surgery," No. 1.

from one epiphysial cartilage to the other. The cavity is syringed out with a solution of corrosive sublimate (1 in 4000), and then with a concentrated ethereal solution of iodoform; drainage tubes are introduced, and wood-wool dressing applied.

Acute arthritis of infants* is the name given by Mr. Thomas Smith to a disease which occurs within the first year of life; the infant may be but a month or two old. The disease begins as **acute epiphysitis**, and, as well as setting up arthritis, it may cause acute suppuration or necrosis within the epiphysis. One of the chief characteristics of the disease is the suddenness with which it comes on and runs its course; another is the extensive devastation which may follow it, should the infant survive; and a third is the rapidity with which it may prove fatal. Sometimes it is directly traceable to an injury received at birth, or to a sudden wrench of the limb. At other times it is a local expression of infantile pyæmia; particularly is this the case when several joints are attacked. The upper epiphysis of the humerus and the femur, and the knee-epiphysis of the femur and tibia, are most often implicated. On making a longitudinal section of the bone after amputation, or *post mortem*, a sinus is generally discoverable running from the joint into a cavity within the epiphysis. Frequently this cavity contains a loose sequestrum.

Symptoms.—The joint is stiffly flexed, swollen, and painful, but perhaps it is not until pus is reaching the surface that the skin becomes reddened. There is generally some heat of the surface, and on gently squeezing the epiphysis between the finger and thumb, evident tenderness is evinced. There is great constitutional disturbance generally, with a high temperature, and the infant flinches whenever the limb is touched. If the medical attendant be unacquainted

* See St. Bartholomew's Hospital Reports, 1884.

with the character of the disease he is apt to take refuge in the diagnosis "rheumatic." But the age of the patient, the acute and progressive nature of the attack, and its localisation, ought to serve for differentiation. When several joints are involved at once, he is still more apt to mistake the pyæmia for "rheumatism."

As the joint becomes invaded—and the arthritis is secondary to the epiphysitis—acute abscess forms, and the bulging capsule yields, unless it is opened surgically; pus is then extravasated round the joint, and if, as may happen, the acuteness of the attack have passed away, and the evidence of fluctuation be not too clear, the case may, perchance, be taken for one of malignant disease, and an incision may be needed to determine its nature. By this time the joint is completely wrecked, the other articular epiphysis being perhaps destroyed in addition; and should the patient recover, an apologetic, flail-like joint is established by a loose fibrous connection between the adjacent ends of the two diaphyses. In after-life the nature of the original trouble is evinced by the white scars where the abscess discharged; these would not be found in infantile paralysis, nor in congenital displacement of the femur—two conditions to which the wasted and deformed appearance of the limb may be erroneously ascribed (pages 162 and 422).

Treatment.—No time must be lost; the case is extremely urgent. A tenotomy-knife must (under the influence of chloroform) be thrust into the joint and into the epiphysis; the diseased tissue should be scraped out and washed away with a mild and warm antiseptic lotion, absorbent dressings being applied, and the limb being fixed in perfect rest. But if the temperature keep high, and the infant show other signs of failure, amputation should be straightway performed. Drop-doses of brandy in milk will be

needed, and the infant must be kept warm and quiet. For the latter indication opium may be required.

The **prognosis** is bad. Nearly half the subjects of acute infantile arthritis die. Some are worn out with pain and diarrhœa; others perish of pyæmia or of rapid septicæmia.

Subacute and chronic epiphysitis is much more often met with than that last described, but though the disease runs a less violent and rapid course, it frequently proves destructive of the joint, and not rarely fatal to the child. (*See also page 78.*)

The disease generally begins, I think, in that line of great physiological activity, where the epiphysis borders on the end of the shaft, though sometimes it quietly forms an abscess in the midst of the epiphysis itself. In either case the joint is apt, sooner or later, to be implicated; then the articulation has to be laid freely open and irrigated, the opening into the epiphysis being scraped out, and free drainage being provided. I have recently had two cases* which were thus successfully dealt with, and which must otherwise have been relegated to amputation.

Though the usual extension of the disease is into the joint, still it may be in the opposite direction—into the end of the diaphysis. The bone then becomes enlarged, and the appearances are not unlike those accompanying sarcoma; it may be only by an incision into the thickened mass that the diagnosis can be surely established. Generally the onset of the trouble can be traced to a fall, blow, or wrench, but sometimes it is lost in obscurity.

Treatment.—From the commencement the child must be kept in bed; rest and posture often give immediate relief to the pain. Incision, irrigation, and drainage must be adopted as soon as possible. By such prompt treatment the joint may be saved; on

* *Lancet*, Dec. 24, 1887.

scraping out the central cavity the surgeon finds how close the abscess was to the joint. It is dangerous in the extreme to allow an abscess to lurk unopened close to a joint. If the joint become involved it must be thoroughly laid open, and washed and drained, and if the constitutional disturbance continue, the temperature running up to 102° or 103° , and the appetite and energy flagging, amputation must take the place of temporising, or the child may develop a chronic or a fatal pyæmia. I am afraid that in some of these complicated cases of joint disease we carry our conservative principles too far.

CHAPTER XXVII.

FRACTURES.

IN the rickety child, the bones, though containing an excessive proportion of animal matter, are brittle. This may be due to the fact that the conversion into the solid bone is accomplished by a process of petrification rather than of ossification.

From the continuous crying or fretfulness, the mother suspects that there is something wrong. Then, when the part is disturbed, during the washing or dressing, there are evident manifestations of pain. Sometimes the nature of the injury is not recognised for a day or two. Often, no history of the child having met with injury is to be obtained.

The first step in the *examination of an injured child* is to have it completely stripped of clothing and laid on a firm, flat surface, such as a table on which a blanket has been folded. This should be without unnecessary exposure to draughts or cold.

Inspection is made for bruises or swellings, or for motionless limbs. Then each limb is examined with the fingers; any apparently tender part especially attracting attention. Each joint is cautiously exercised, and, so far as practicable, the integrity of each epiphysial cartilage tested. The child should be turned over, and the spinal column examined. The ribs are rarely broken, on account of their great elasticity. The child should be kept in his cot for a day or two, for the appearance of some local swelling and tenderness may prove that a joint has been sprained, or the periosteum bruised.

The *diagnosis of fracture* may rest upon circumstantial evidence; thus, the child was well in the morning, later on he is found crying, and unable to move the swollen limb. This is usually enough; the suddenness of the occurrence, the existence of circumferential swelling, and the evidence of tenderness. The swelling is due to effusion about the seat of fracture; but if the periosteum and muscular attachments be not torn through, there will be no displacement. The periosteum is thick and tough, and steadies the fractured surfaces. The swelling at the seat of fracture will be found deeply placed, and extending all around the bone.

On fixing the limb above the tender swelling, and grasping the elbow or knee with the other hand, and gently moving it from side to side, a characteristic yielding is noticed at the fracture. To inquire for crepitus in such circumstances is unnecessary; it may damage the periosteum, or possibly may convert a partial into a complete fracture. In children, fracture is apt to be situated at the line of an epiphysial cartilage, in which circumstances crepitus might not be definitely obtainable except by the rudest violence.

Chloroform will hardly be required for diagnosis,

unless the fracture be near a joint. But if, after careful examination, the surgeon be unable definitely to ascertain the existence of fracture, the limb should certainly be dealt with, at any rate for the time, as if that lesion existed. In certain delicate, but otherwise healthy children, the skeleton is extremely brittle, one long bone after another breaking from trifling injury, and perhaps on more than one occasion. The fact of firm consolidation taking place in due course, under the ordinary appropriate treatment, is evidence of the non-malignant nature of the troublesome condition. The term usually applied to it is **fragilitas ossium**. The child requires careful supervision, rest, fresh air, good food, and medicinal tonics.

The greater the proportion of animal matter in the growing bone, the greater is the liability for the bone to be bent without its tissue being entirely broken through. There are two varieties of this **incomplete fracture**. The bone may be broken half-way through, whilst the other part is only bent.

Secondly, the bone may be bent without real breakage having occurred. The term green-stick "fracture," which is applied to this second kind of injury, is a misnomer. The clavicle of the rickety child is very liable to green-stick bending.

The long bones may be *broken in utero*, from the effect of injuries received by the mother. During parturition, also, fracture may take place, either from the forcible expulsive efforts, or under the influence of assistance rendered by the bed-side attendant. A case is on record in which, from officious help at birth, the lower epiphysis was separated from the shaft of the femur, and the upper one from the tibia. These injuries may occur even in the case of the well-developed and healthy foetus. (See also page 413.)

The **treatment** of incomplete fracture may involve the forcible effacement of any angular deformity. The straightening should be accomplished under an anæsthetic, and during its performance it is quite possible that the unbroken fibres of the bone may be felt to be yielding, and a definite crepitus may declare itself. The limb is then put up in moulded splints, the skin having first been protected by a soft bandage or an even padding of wool. The constitutional condition must be attended to (page 72). Lime-water may be advantageously mixed with the milk, and especially so in hot weather. These cases generally do well, the bone becoming quickly consolidated, whilst the improved hygiene to which the child is subjected produces a marked benefit. The less that the part is disturbed the better, and it will be advisable to preserve it long at rest, lest the uniting medium be found of insufficient stability, and *angular deformity* supervene. If either without, or in spite of, surgical treatment such deformity be found in extreme degree on the completion of union, it will be better to administer chloroform; then, if necessary, the bone may be straightened over the knee, but the existence of epiphysial cartilages must be remembered. But if the deformity be not very marked or unsightly, it will be better, ensuring rest, to leave it to nature. It is truly surprising to find how, with the growth of the bone, and with the absorption of the redundant cement, the angularity steadily diminishes. Refracture should be undertaken only after the conclusion has been deliberately arrived at that the case is beyond the range of adequate improvement if left uninterfered with.

The **clavicle** of a weakly or rickety child may be broken by a small amount of violence. The child cries and does not move the arm; quickly a swelling appears at the spot. To diminish to the utmost the

pressure on sensory nerves, the child holds his head down to the damaged side, and, shrugging up his shoulder, it becomes a difficult matter for the surgeon thoroughly to inspect the part. Probably the periosteum will not be torn through. Occasionally both clavicles are found bent or broken.

There will be no "dropping of the shoulder" as in the adult, and no search is to be made for crepitus. It suffices that the child has met with an accident, and that he now does not move his arm, that a tender swelling has suddenly appeared about the middle of the clavicle, and that the head and shoulder are approximated. By tracing the finger along the tender part an unevenness in the course of the bone may be made out.

The **treatment** demands rest for the bone, by fixing the arm to the side with a few turns of a soft, wide roller, and it is better to imprison the hand as well. The turns of the roller may be kept in place by a few stitches, and a close-fitting cinglet may be drawn over all. A thin layer of linen may be laid between the naked arm and chest, and violet powder may be dusted. An axillary pad will not be required ; the arm is simply to be steadied against the chest for the space of three or four weeks.

Soap plaister is not well adapted for securing the limb ; it becomes loosened by the warmth of the body, and is then thrown into cord-like bands. It is, moreover, apt to cause an eczematous eruption.

The **humerus** is not so frequently broken in its shaft as is the femur. The hand and fore-arm and arm having been smoothly bandaged in a soft roller, mill-board splints softened in hot water, or any plastic material properly prepared, must be evenly adjusted around the limb from the axilla above to the elbow below. The elbow may then be bent and the entire limb fixed against the side of the chest. Nothing is

gained by letting a restless child have his hand free. A cinglet may be used for keeping the bandage from disturbance.

If persistent complaint of discomfort be made during the progress of the case, the part must be exposed and thoroughly inspected. Children do not complain without cause ; perhaps a piece of hardened splint is pressing unevenly, or one turn of the roller has become tightened, or an abscess is forming about the bone. At all events, the limb must be examined

and secured again. Sometimes it gives comfort gently to rub the bared limb in the direction of the venous return before re-applying the bandage, but the mere re-adjustment may restore comfort. The limb should be kept at rest for four weeks, and then gradually restored to freedom.

Non-union of fractured surfaces is of extreme rarity in childhood : but the osseous cement is apt to yield to weight, especially in weakly children.

A word of caution must be given against applying bandages tightly or unevenly ; erysipelas or gangrene may follow such constriction. The softer and more elastic the material of which the roller is made the better ; domette is preferable to cotton, but the soft

open-work cotton rollers do well. If plaster of Paris be used (and there is no better material for the purpose) it should not be applied in the meshes of a roller bandage, but in lateral splints of house flannel, which have been duly cut to shape. These splints are then evenly secured by a few turns of a roller bandage made of "butter-cloth muslin."

Fracture may take place **through the upper**



Fig. 63. —Humerus, Upper Epiphyses, and Inner Condyle detached.

epiphysial cartilage. The plane of the fracture may deviate slightly from the plane of the cartilage, in places passing through young and fragile bone tissue. With so extensive and rough a fractured surface it is hardly likely that there would be the complete displacement; nor is it certain that one would be able to obtain a definite crepitus, for on rotating the arm the upper fragment would very likely rotate with the shaft.

The line of the epiphysial cartilage does not pass in a horizontal plane, but is arranged in such a way that the head of the bone receives the conical end of the diaphysis into a sort of socket.

To inquire too closely for crepitus is to cause undue pain and needless local disturbance, but it will be advisable to put the child under the influence of an anæsthetic, and thoroughly but gently to examine the swollen shoulder. There must always be decreased freedom of movement when a bone is broken near a joint: in the case of this fracture the shaft of the bone may be moved without disturbing the articular end.

Treatment.—Whether the diagnosis be clearly made out or no, a small flat pad of cotton-wool, folded in a soft handkerchief, may be placed in the arm-pit, and the arm and hand fixed against the side of the chest, as in the case of fracture of the clavicle. It is well to mould a splint over the deltoid region; no inside splint can be of service, the fracture being high in the arm-pit. The chest affords an excellent support for the shaft fragment. The fore-arm and hand should be worn in a sling.

The elbow and fore-arm must not be raised, lest the upper end of the shaft fragment do not remain in the proper position, and so, after the removal of the bandages, unevenness would be found at the line of fracture. Even after the exercise of much skill and

attention some irregularity may be detected on the removal of the splint. This should cause neither alarm nor anxiety; it will probably be smoothed off with the subsequent growth of the bone; and when the deltoid has been fully exercised again, any little shapelessness will be shrouded under the thickening bundles of muscular tissue. I have seen most marked deformity at the shoulder completely disappear within a few months of the arm being released.

If, when all swelling has subsided, union be taking place with some deformity, the surgeon should think twice before breaking it down with the idea of re-setting the bone. Such interference might result in fracture of the bone in a fresh place, or might be followed by serious local disturbance. Nature may be trusted to effect a marvellous improvement with the course of time.

Union of an epiphysis is, as a rule, quickly effected, so that the parts should not be fixed for more than three or four weeks; they should then be allowed complete freedom. If the arm be kept longer in the bandages the stiffness is slower in working off. Exercises and massage expedite the usefulness of the limb.

General caution.—In every case of fracture near a joint or through an epiphysis, it is desirable that the surgeon, however skilled and competent he may be, do not take the undivided responsibility of the case. Some untoward event is apt to be associated with the injury which no exercise of art can with certainty avert. Thus, suppuration may occur, and death follow from pyæmia; or synostosis or other form of permanent stiffness may result; or there may be some deformity; the humerus may fail to be properly developed, and the limb may be less useful than was anticipated.

Over the result of the treatment of injuries near a joint, skilful as it may have been, great

dissatisfaction is apt to ensue. Therefore, the parents should be made at once to thoroughly understand the serious nature of the injury, at least as regards the future effect ; they should not be caused needless alarm, but should see the advisability of adopting precautions. A shoulder or elbow left permanently stiff may well-nigh ruin a professional reputation ; its existence is never forgotten. In every country village some brother practitioner can and should be found to help, just after the injury, with anæsthetic and with counsel.

Ages at which epiphyses become ossified.

—The special nutrient arteries of the long bones course, in their respective bones, towards the elbow and from the knee. Now, the epiphysis towards which the nutrient artery runs is invariably the first to join the shaft, therefore the elbow-ends of the humerus and radius are attached early, whilst the knee-ends of the femur and tibia are attached late. Thus, in the growth of the arm the integrity of the elbow epiphyses will be of secondary importance to those near the shoulder and wrist ; whilst, in the lower limb, the knee-ends of the femur and tibia are of chief concern. Roughly, one may say that the epiphysis towards which the nutrient artery is running is ossified to the shaft soon after puberty, whilst the other epiphysis delays its attachment until about the twentieth year, that is until growth is completed.

Fracture through the lower epiphysis is apt to be mistaken for dislocation at the elbow joint. The epiphysial cartilage passes horizontally just above the condyles, the trochlea, and the capitellum. These portions of the humerus have separate centres of ossification, and (with the exception of the internal condyle) coalesce to form an epiphysis which is united to the shaft in the sixteenth or seventeenth year. (The internal condyle joins with the shaft in the eighteenth year.)

The plane of the fracture may wander slightly into the adjoining bone tissue. The injury is most likely caused by a fall upon the elbow, by a wheel passing over it, or by a fall upon the outstretched hand.

The **diagnosis** is generally easy, but if the signs be indefinite, an anæsthetic should be administered

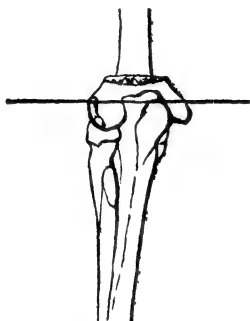


Fig. 64.—Fracture through Lower Epiphysial Cartilage.

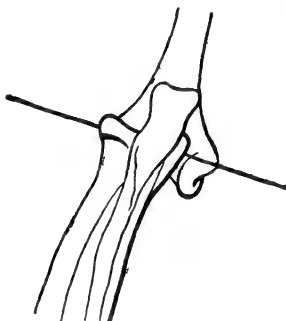


Fig. 65.—Dislocation of Radius and Ulna backwards.

and a deliberate examination made. It may be noticed that the front of the fore-arm is shortened, and that there is a projection behind the lower end of the humerus. On grasping the limb above and below the joint, a strange lateral movement is detected. The joint-fragment, if previously displaced, can be easily restored, though it is apt to slip back again. The movements of pronation and supination are permitted; the top of the olecranon process is still in the normal horizontal line with the condyles of the humerus. Now in the dislocation, as shown in Fig. 65, the top of the olecranon process is raised high above the normal line, the line of the condyles of the humerus. The fracture is not necessarily accompanied with

displacement. The nature of such an injury is not likely to be overlooked if the rule be followed of grasping the shaft with one hand and the condyles with the other, and searching for the characteristic lateral movement. In the case of the backward dislocation of the bones of the fore-arm being incomplete, the elevation of the olecranon will not be characteristic; its absence, therefore, must not exclude the diagnosis of luxation.

Treatment.—The hand and fore-arm should be evenly bandaged, and a layer of cotton-wool should be

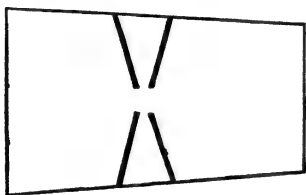


Fig. 66.—Pattern for Elbow Splint.



Fig. 67.—Elbow Splint applied.
(After Lonsdale.)

secured around the flexed elbow joint, the bandage being subsequently continued up the arm. A plastic splint having been already cut to the paper pattern, and prepared, should be moulded to the elbow, the joint being arranged at a right angle, and being steadied as the mould hardens. It matters not of what material the splint be composed so long as the surgeon be handy with it; common house-flannel soaked in creamy plaster of Paris, Hide's or Cocking's splinting, mill-board, undressed leather, guttapercha, any one of them will do, but it must be applied with evenness and firmness. It should be long enough to reach well up the arm and down the fore-arm. The adjoining figures show the felting notched ready for softening and application, and the splint moulded on

to the elbow. The arm had better be secured inside the dress for three weeks.

The thickening and stiffness will subside in time, and it will not be advisable to attempt to expedite matters by forcible manipulation or flexion. Parents should (page 406) understand that the joint must be stiff for some time subsequently, and that in rare instances the joint remains permanently affected; while

fracture at that particular spot is a serious injury. Should deformity with ankylosis follow, excision of the joint might be deemed expedient.

Sometimes the separation of the epiphysis is complicated with a vertical fracture into the elbow joint, in which case, in addition to the signs already given, it will be found that on catching the condyles firmly between the fingers and thumb they are not in solid connection with each other or with the shaft. The *treatment* will not differ from that advised



Fig. 68.—Fracture through Lower Epiphysial Cartilage of Humerus, extending into Elbow Joint. "T" fracture.

in the previous case, and it must be explained from the first that some deformity and stiffness may probably remain even permanently. It is also possible that the injury may be followed by a partial *arrest of development* in the lower end of the humerus. Indeed, in every case of fracture through an epiphysial cartilage, subsequent shortening of the limb may be involved. Fracture may extend obliquely into the joint through the epiphysis, without there being a detachment of the epiphysis. This is made out by the fact that one condyle is loosened, though not detached, and that a

certain amount of lateral movement is obtainable at the elbow joint. Crepitus may be detected on flexing and extending the joint, or on rotating the radius. The *treatment* will be that just described.

One of the condyles may be broken off without the joint being implicated, or the lower epiphysis being otherwise hurt. The inner condyle is the more likely to be found detached, on account of its being more exposed to injury in a fall upon the elbow; it does not join the shaft of the humerus until the eighteenth year. To secure a bony union of the loose internal condyle, the elbow should be kept flexed for a few weeks in a moulded splint. Sometimes it becomes attached to the humerus by ligamentous tissue only, but, fortunately, this faulty union entails no serious inconvenience.

After a limb has been confined in absolute rest for two weeks, or a little more, it may be advisable to take it down for a few minutes in order, with the utmost care and gentleness, that each joint may be judiciously exercised. In this manœuvre there should be no disturbance of the seat of the fracture, and immediately afterwards the limb should be restored to security. If the movements give pain they should not be persisted in; in this case there would probably be some inflammatory trouble still lurking about the joint.

At the end of two weeks the swelling would probably have subsided, and the surgeon could reassure himself of the parts being in perfect apposition. If by chance there had been any misconception of the nature of the original lesion, the error could at this early date be easily rectified.

But if weeks or months after the injury, when all thickening has disappeared, the bones be found much out of place, it is better still to leave nature to effect a gradual improvement in the usefulness of the arm than to suggest operative interference (page 406).

The **stiffness following injury to a joint** should never be dealt with by speculative force, for the violence necessary to break down adhesions might cause disjunction of a neighbouring epiphysis. In any case it is apt to set up a serious arthritis. With fracture near the extremity of a long bone, the joint is sure to suffer temporarily from adhesive synovitis. Roughly to move the joint might be to wreck it completely. Stiffness in childhood almost certainly works off in time, unless a fracture seriously damaged the joint. On the subject of stiff joints in childhood, Sir James Paget writes that happily "bone-setters" are allowed to have but little practice among children. Happily, for children's joints are much more imperilled by violence than those of older patients.

Fracture of the **radius** and **ulna** may be incomplete. The bones may require straightening before the splint is applied. The limb should be evenly bandaged from the hand upwards, and enclosed in plastic splinting. Wooden splints are inconvenient for children; they are apt to press unevenly, and to slip out of position. If used they should be secured with wide bands of soap plaister. For about three weeks the apparatus should be worn, and for the first few days it will be convenient to keep the child in bed, with the arm raised upon a pillow. Traumatic effusion is much better treated by even compression than by lotions.

The **radius**.—Fracture may take place through the lower epiphysial cartilage, from a fall upon the outstretched hand; the symptoms will be similar to those met with in a Colles's fracture, but, from the squared direction of the separation, malposition of the fragment is unlikely to occur. Such an injury might interfere with the due growth of the bones of the fore-arm. The head of the **ulna** is rarely detached. A plastic splint should be moulded on the fore-arm,

wrist, and palm, and kept there for about eighteen or twenty days.

Metacarpus.—The first metacarpal bone is developed like a phalanx, the epiphysis being at its proximal end. A blow from a stick or a cricket-ball might detach the epiphysis. Fracture through the epiphysial cartilage of the first metacarpal bone might be mistaken for a dislocation. The treatment for each injury is the same. A splint should be moulded, and the hand should be worn in a sling.

The **femur** may be fractured at the birth of the child, especially if the presentation be the “breech,” and the delivery be assisted by the blunt hook. Dr. Packard* quotes an instance in which the femur had been fractured within the uterus, and had become consolidated before birth. He also remarks that cases of spontaneous fracture are more common in the femur than elsewhere, by reason of the great leverage afforded by the length of the bone ; and he gives the record of a case in which the leg doubled up as the child was simply walking across the floor, the thigh bone having given way in the middle of the shaft.

There is, as a rule, no displacement at the seat of fracture, the line of which is transverse. There is, therefore, no shortening of the limb to be dealt with. But near the middle of the shaft a deep-seated and tender swelling may be detected—a swelling which has promptly followed an injury.

The **treatment** of a broken femur in a child is a simple affair. For an infant at the breast, or in arms, it is sufficient to bandage the two limbs together, from the feet and ankles up to the pelvis ; a few stitches may be used for securing the turns of the soft roller ; some padding of cotton-wool should be placed between the ankles and knees. An infant at the breast obviously cannot be kept in bed.

* Ashurst's “*Encyclopædia of Surgery*,” vol. iv. p. 200.

Broken thighs in children always do well ; extension and counter-extension are not wanted, for there is no over-lapping, and all that is necessary is to keep the little patient at rest and protect the limb from disturbance. Or the limb of the damaged side may be enclosed in a domette roller, and the thigh surrounded with mill-boards, or with lateral splints of plaster of Paris. If the case be treated by the stirrup and weight, the drag on the limb should be sufficient only to steady it. Perhaps there is no better way of treating a case than by means of a Thomas's hip splint (page 439), but in private practice an apparatus to fit is not likely to be ready at hand. The same remark applies also to the box splint. But if a box splint be used, the simpler it is the better.

Whatever be the kind of apparatus selected, it must not hurt or chafe, require frequent readjustment, nor become spoiled from being wetted or soiled. Perineal bands must not be used.

A good plan is that commonly adopted at Guy's Hospital, of applying a stirrup (page 437) and passing a cord from it to a pulley above the bed, so that the limb, extended at the knee, is flexed at right angles to the abdomen, and kept up out of the way. If the child be small both limbs may be thus fixed and preserved from the risks of being soiled.

The **lower epiphysis** of the femur becomes joined to the shaft at about the twentieth year. It may be separated from the diaphysis, tearing away much of the periosteum from the shaft. Unless the case were seen directly after the accident, the exact diagnosis might be obscured by effusion ; lateral movement, and possibly crepitus, would be the chief signs. It is hardly likely that there would be much displacement, unless the violence were great, or the fracture compound. The injury would be best treated by placing the knee in slight flexion. A small McIntyre splint,

or a small plastic one moulded on the limb, would maintain the surfaces at rest ; with the latter splint, the patient could be moved about. The part must be inspected from time to time, without disturbing the fragments, as suppuration is apt to complicate the injury. If the fracture were compound, amputation might be advisable, especially if there were much injury to the vessels, nerves, or other soft structures. Sometimes the separation of the epiphysis is associated with a vertical fracture into the joint. At other times the violence stops short of the separation of the epiphysis, but causes an oblique fracture into the joint between the condyles.

In these cases, the looseness of the condyle points to the nature of the injury. The knee should be put up almost straight, lest permanent stiffness of the joint should supervene. The even compression of a packing of cotton-wool inside a plastic splint will be found very comforting, and division of the tendon of Achilles may prove of advantage.

The upper epiphysis of the **tibia**, which includes the tubercle, is united with the shaft at about the twenty-fourth year, the lower joins at about twenty-one. In simple fractures of the bones of the leg in childhood, the most convenient treatment will be with the lateral splints of plaster of Paris. The knee can thus be bent, and the limb laid on its side ; in this way all tension is taken from the gastrocnemius. The even compression, if applied early enough, prevents the occurrence of swelling, and ensures rest.

If a rickety child be the subject of fracture in the thigh or leg of a valgous or otherwise deformed limb, the parts should be arranged so as to effect the greatest amount of improvement in appearance. During the confinement of the child in bed, the other limb, if that be also deformed, may undergo considerable improvement.

Compound fractures do generally better than in adults; the kidneys of children have not been damaged by high living and alcoholic irritation, nor has the nervous system been shattered by over-work, and by the worry and anxiety inseparable from the struggle for existence. Suddenly incapacitated from lessons or play, the child's present and future are as free from care as the past is from regrets. Children live from day to day, and, like the lower animals, which in many respects they closely resemble, they bear serious injuries with patience, and very often surmount them with triumph. The popular idea is that a child must fret and grow thin if kept in bed week after week; children bear confinement better than adults, as a rule, but parents are apt to deal with them injudiciously when they are in bed; kindness should include firmness. Children in a hospital ward are generally more unmanageable or troublesome on the evening of "visiting day."

Treatment.—Even if a main artery be torn through, as may likely happen with a compound fracture near the ankle or elbow, the limb is not necessarily to be condemned for amputation. A limb mangled by machinery will be very likely to be found hurt past all surgery; but if there be a doubt in the surgeon's mind as to whether he should amputate or attempt to save a limb, he should give conservatism a trial.

Before the final decision is arrived at, the child should be put under an anæsthetic, and the limb above the wound firmly surrounded by a few turns of an elastic band (not a cord, as that is more apt to injure the soft tissues), and a careful inspection made. All dirt, foreign bodies, or loose pieces of bone, should be carefully picked or syringed out. Main arteries should be looked to, and, if lacerated, tied above and below the tear. If a large nerve be found torn across,

its ends should be held together by one or two fine catgut sutures. Provision must be made for drainage, the edges of the wound brought together by wire sutures, and the entire limb bandaged and fixed on a splint, and the child, of course, kept in bed. The primary washing may be with a weak solution of carbolic acid, corrosive sublimate, or even pure water; and the dressings may be those of Lister, or iodoform wool, or dry lint. An even compression around the wound will be a valuable therapeutic aid; and the less that the parts are disturbed the better.

Traumatic gangrene.—As regards the time for operation should gangrene supervene: If the fingers or toes become blue, and the discoloration ascend, or if the entire limb below the wound be found, in the course of a day or two, devoid of sensation, chilled and unwholesome, amputation should be performed straightway, and as far above the fracture as may be necessary for obtaining sound skin for liberal flaps. There should be no waiting for a line of demarcation. Wine and quinine will be required, and small doses of perchloride of iron at short intervals. Opium should be administered as may be necessary, a careful look-out being kept against its toxic effects.

Fracture of the skull.—Children may recover from desperate injuries to the head, for the cerebral system is in an imperfect stage of development. A severe lesion may be attended with but slight symptoms. I have seen the side of the skull deeply indented from a kick, a great portion of the parietal bone being thrust inwards, yet with time, and without interference, the elasticity of the bone has effaced the dent, and all signs of disturbance have passed away. Even with the immediate supervision of symptoms of compression, the surgeon should hesitate before proceeding to trephine. Nature should be

afforded full opportunity of working recovery in her own way.

On account of the thinness of the skull bones, *punctured wounds* of the brain are apt to occur, but though the instrument causing the puncture may have been driven several inches within the skull, still no symptoms may arise. Later on, however, intracranial hæmorrhage or suppuration may occur, with symptoms of compression, in which case trephining will, of course, be demanded. Of this operation I have had a most successful case in a boy who was in St. Mary's Hospital with aphasia and right hemiplegia, which came on a few days after a fall (*Brit. Med. Journ.*, Oct., 1888).

Traumatic cephal-hydrocele is met with only in childhood. It is the result of a fracture of the vault of the skull, with escape, beneath the aponeurosis, of cerebro-spinal fluid. If the fracture were compound there would be no subfascial tumour, as the fluid would run away through the open wound. The wave of intracranial pulsation may be transmitted through the fissure to the swelling, but pulsation is not always present. There may be but little constitutional disturbance, and recovery often takes place.

Several cases are alluded to by Hulke, in his article in the "System of Surgery."* In a child under the care of Hey, of Leeds, in 1809, a watery fluid was discharged from a compound fracture of the forehead for three weeks. Another child recovered after the escape of fluid following an injury caused by a kick. In another case, a pulsating tumour, occurring after simple fracture in the frontal region, was tapped with a fine trocar. The child eventually died, and it was found that a probe could be passed through the fracture into the brain.

* Third edition, vol. i. p. 596.

Godlee has brought forward* two other instances:—An infant of eight months fell from a height on to the head; a pulsating tumour occurred, which was punctured, a muddy fluid being withdrawn. The infant died. An examination showed a large hæmatoma, which communicated with the interior of the descending cornu of the lateral ventricle by means of a wide gap in the parietal bone. The other case is very similar; at the autopsy the bone was found quite thin, and partially absorbed. The question as to the cause and the nature of the absorption of the bone tissue at the seat of fracture is an interesting one. Probably in most of these cases there is rupture of the cerebral ventricle. When the brain is lacerated, the fluid will be chiefly derived from the descending cornu of the lateral ventricle. Some of it may be the result of inflammatory effusion, and some, especially when the tumour is associated with recent injury, may be blood serum. Should the fluid become purulent, the gravity of the *prognosis*, which is always considerable, would be much increased. Large amounts of discharge do not necessarily entail a fatal issue, but sooner or later, in any case, meningitis may supervene. The pulsating tumour must be taken as evidence of the existence of a fissured skull, and of damage to the dura mater and arachnoid, possibly, also, of the brain itself.

Treatment.—No further active interference than the occasional tapping of the tumour would be generally advisable; if suppuration ensued, free incision, antiseptic washings, and drainage would be demanded. Exploration and trephining would be of very questionable value. The exertion of a certain amount of pressure by pad and bandage might serve. The child should be kept quiet, and fed on milk and water. The

* *Medical Times*, Jan. 10, 1885. See also *American Journal of Medical Science*, July, 1884; and *Guy's Hospital Reports*, 1884.

condition of the bowels and of the bladder should be attended to.

It is convenient here to speak of the common blood-tumour of the scalp—the **cephalhæmatoma**. Though usually resulting from bruising during the passage of the head through the pelvic straits, or from the pressure of the forceps of the obstetrician, it may occur from any other contusion. Vessels are ruptured, and blood is effused beneath the pericranial aponeurosis—not superficial to it, because of the intimate connection with the scalp. The largest cephalhæmatoma that I have seen followed a slight injury over the parietal bone of an unhealthy boy. It was as large as the palm of a man's hand, and was much raised; the contents seemed very thin and serous. It was not interfered with; tonics were prescribed, and gentle frictions were employed; the fluid was absorbed with surprising rapidity. There was no tenderness, heat, or discoloration of the scalp.

When a thin layer of effusion exactly occupies the parietal area, the condition resembles absence of the parietal bone; then as the blood is absorbed at the periphery, the bone seems to be ossifying. Ossification of the bone, however, spreads from the centre, not from the periphery.

There is sometimes a strangely deceptive feel about these blood-tumours, especially if the area of the contusion be limited: a firm, definite, and elevated ring of inflammatory lymph surrounds the softer and bruised tissue; and feeling this for the first time, one is inclined to affirm that the central part marks a depressed fragment of the skull, and that the raised margin is the edge of the bony gap. There are, however, no "brain-symptoms," nor is there pulsation from within the skull. In the case of fracture, the hard ridge would not be above the level of the rest of the skull, but with the blood-tumour it is so.

Treatment.—The surface of the tumour may be gently rubbed with oil several times a day, to promote absorption, but no active interference of any kind is demanded. The effusion is gradually absorbed, and in a few instances only have I known suppuration to be involved; free incisions, antiseptic washings and drainage, and compression are then required.

CHAPTER XXVIII.

DISLOCATIONS.

DISLOCATIONS from injury are extremely rare, for the simple reason that violence to a bone near a joint is much more likely to expend itself in detaching the epiphysis.

Of traumatic dislocations, the only one that is at all likely to occur is that of the *bones of the fore-arm backward*, the coronoid process of the ulna being at the same time detached.

The dislocation having been reduced in the ordinary way, the elbow had better be enclosed for a fortnight or three weeks in a moulded splint. In an unhealthy constitution chronic inflammation is apt to supervene on the severe injury to the synovial membrane. (For differential diagnosis from separation of epiphysis, *see* page 408.)

A dislocation of the radius, which seems to be **peculiar to early childhood**, is that in which the head of the bone slips out through the orbicular ligament; it is apt to occur when a child is lifted, swung, or dragged by the hand. No characteristic deformity

is presented, but the elbow is, of course, swollen and tender, and the freedom of its movements is interfered with. The nature of the lesion is very apt to be overlooked.

The reduction is best effected by flexing the elbow to a right angle, or beyond it (so as to bring the radial head up to the capitellum), and at the same time gently but fully to pronate the fore-arm. (The latter movement screws, as it were, the head of the radius through the orbicular ligament.) The reduction is accompanied by a "click." The elbow had better be left fixed at a right angle for a week or so.*

There have recently been under treatment two children with dislocation of the **radius forward** from injury. One case had been an uncomplicated luxation, the other had been associated with fracture of the humerus into the joint. The former case was of some months' standing, and did not prove amenable to treatment.

Luxation of the **proximal phalanx of the thumb** may require excision of the head of the metacarpal bone.

Of **congenital dislocations**, the most important is that of the head **of the femur**. The luxation may exist on one or both sides, and is more often found in girls than in boys.

The **signs** of the dislocation are not, in infancy, characteristic. The probability is that the lesion will pass unrecognised until the child begins to stand, when, from the centre of gravity being in advance of the normal line of support, the equilibrium will be unstable. If luxation be symmetrical, the child develops incurvation in the loins (lordosis) in order that the centre of gravity of the body may be restored to the proper situation by bringing the upper part of

* "Annals of Surgery," August, 1885.

the body well backwards. (But if the deformity be unilateral the thigh of that side will be found small and flabby.) Thus the abdomen is rendered prominent, and the buttocks are large and salient. When the subject is in the horizontal position, the chief characteristics of the luxation become effaced. Where the affection is unilateral, there may be difficulty in forming a positive diagnosis. The child walks with a reeling gait. The chief points in the *differential diagnosis* are the absence of pain both in the knee and in the hip; the shortened limb may be drawn down to the normal length by steady traction, the child showing no evidence of distress; the thigh bone can be rolled and everted in its bed upon the dorsum of the ilium. The top of the great trochanter is found above the line which is drawn round the buttock from the anterior superior spine of the ilium to the tuberosity of the ischium. The lordosis is best marked when the lesion is symmetrical, the abdomen and the buttocks being then extremely prominent, as shown in Fig. 69; and on account of the shortness and the small girth of the lower limbs, the upper part of the child's body appears disproportionately large.

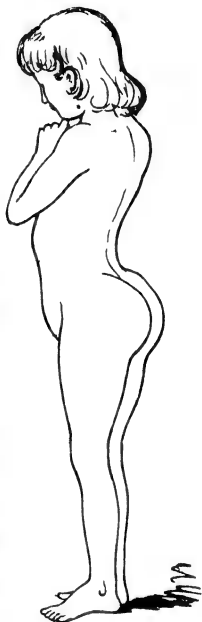


Fig. 69.—Congenital Dislocation of Femora. (After Brodhurst.)

A simple and exact way of comparing the length of the lower extremities in this or any other condition is to lay the child flat upon the back, with the pelvis

Congenital dislocation of the patella.—

With knock-kneed children, the patella is necessarily displaced considerably outwards. In the case of the congenital dislocation, attention may be drawn to the condition only after the receipt of some accident.*

CHAPTER XXIX.**HIP-JOINT DISEASE.**

THE term hip-joint disease is convenient in that it conveys a definite idea of one or more of a series of pathological changes which frequently affect that joint in childhood. It should not suggest, however, that these morbid conditions differ from those which may ordinarily be found in other articulations. Whatever the stage of the disease, stiffness of the joint will be always the chief objective sign. The disease may be started by a strain of the round ligament, or may begin as a strumous or tubercular osteitis or synovitis. The head, the intra-articular part of the diaphysis, or the junction-cartilage may be attacked: in the last instance the head of the bone is cast adrift in the interior of the capsule, where, on exploring the joint, or performing excision, it may be found bathed in pus, and much eroded.

Though one cannot affirm that hip-joint disease is invariably the result of some remembered or forgotten injury, still, by careful questioning, one can very often learn that some weeks or months before the trouble began the child received a special hurt from a fall from the bed, a fall down stairs, or from a bench at

* See Trans. Clin. Soc., Oct., 1884.

school, or that he was pushed down the steps by some boy as he was hurrying out from school. But, on the other hand, one may find the joint attacked in a patient who for a year or two has been bed-ridden and unexposed to any chance of injury. In a notable instance, just as one hip joint was becoming convalescent after very prolonged treatment, the other was attacked; in a second case the disease began after the boy had been two years or more under treatment for knee-joint disease. Sometimes the disease is due to the exhaustion following one of the exanthemata.

Mechanics of the disease.—If at the time of the accident the boy falls on to the outside of the partially flexed thigh (a very likely contingency), the ligamentum teres is submitted to serious strain.

The course of the pathological events in the case of a sprained ligamentum teres cannot be followed as closely as can those of a sprained ligament of the ankle joint; but, from analogy, one can, in the mind's eye, see the ligamentum teres slightly injected after its rough usage. Then its substance is infiltrated with inflammatory exudation, and permeated with leucocytes, whilst the synovial membrane, which is virtually incorporated with it, is participating in the morbid changes.

The ligament, which is now swollen and tender, can no longer lodge in happy disregard of the movements which take place between the head of the femur and the depths of the acetabulum. Two conditions are therefore demanded: first, that the head of the femur shall be so placed in the acetabulum as to exert the least possible pressure against the swollen ligament; secondly, that there shall be no sudden movement at the joint by which any bruising of the tender tissue may occur.

The first provision is obtained by the thigh becoming slightly flexed, for then the strong and unyielding part

of the capsular ligament is rendered slack. The posterior part of the capsule is of no mechanical importance, whilst the anterior part is extremely thick (so that it may prevent the head of the femur leaving the front of the joint in violent extension). In flexion of the limb, this strong part of the capsule is loose, and the head of the femur lies gently against the bottom of the socket; the more that the ligament is tightened, as happens in extension of the limb, the more firmly is the femur forced against the floor of the socket.

The provision against sudden and jarring movements is accomplished by the muscles at the front of the joint being kept on the alert against interference from without. They are thrown by reflex influence into a state of watchful and shielding tension.

Just as the shrouds ascend from the hull of the ship to the head of the mast to steady it, so do these muscles, from the tensor fasciæ femoris on the outer side to the adductor longus on the inner, concur in the fixation of the thigh bone. Probably the most important service in this respect is rendered by the mass of the psoas and iliacus.

As the synovial membrane becomes implicated, a considerable increase of its secretion takes place, so that a painful tension of the fibrous capsule occurs. How will the hip joint arrange itself so as most comfortably to accommodate this increase of fluid? The question is answered by this experiment: When fluid is injected with a syringe from the pelvic side into the interior of a freshly dissected hip joint, the first amount causes the femur to pass into the position of slight abduction, whilst a further injection determines its flexion towards the abdomen. From this it must be inferred that the greatest capacity of the joint is obtained, first, when the thigh is slightly abducted, and next when it is carried into flexion. It is to a large extent the effusion into the capsule which, in this

stage of the disease, causes the fixedness of the limb. This also may be demonstrated by injection of the dissected joint, as well as by the effect of puncturing the capsule in the case of acute effusion (as detailed on page 445), when the position of the limb may be straightway improved or altogether corrected.

In the early days of hip-joint disease, when the fluid is beginning to accumulate, the thigh may now and then be found in the position of slight abduction ; but abduction passes so quickly into flexion as to go unnoticed ; or it may be obscured by the flexion. I do not imply that the sero-synovial fluid of the inflamed joint *forces* the limb into these positions ; but that, by the assumption of these positions the painful intra-articular tension is reduced to a minimum.

After flexion has accomplished its utmost in the diminution of the joint tension, and the anterior muscles are found by the timid patient to be insufficient in shielding the inflamed area against accidental shocks from without or muscular startings from within, comfort will be obtained by resting the knee of the diseased side over the front of the opposite thigh ; and, further, by bringing it on to the front of the abdomen, or even up on to the chest itself, where the child can further steady it with his hands and arms, and with his chin. He has usually passed through intense and prolonged suffering before the limb has been compelled to take up this position of extreme flexion, adduction, and inversion.

Pain in hip-joint disease is apt, like the cry of the plover, to decoy one from the object of the search. As a rule, and certainly so at the beginning of the trouble, it is located at the knee joint, over the patella, or along the front or the inner side of the thigh : that is, in the area of distribution of the terminal filaments of the obturator nerve. One filament of the obturator nerve has entered the hip joint for the supply of the

is presented, but the elbow is, of course, swollen and tender, and the freedom of its movements is interfered with. The nature of the lesion is very apt to be overlooked.

The reduction is best effected by flexing the elbow to a right angle, or beyond it (so as to bring the radial head up to the capitellum), and at the same time gently but fully to pronate the fore-arm. (The latter movement screws, as it were, the head of the radius through the orbicular ligament.) The reduction is accompanied by a "click." The elbow had better be left fixed at a right angle for a week or so.*

There have recently been under treatment two children with dislocation of the **radius forward** from injury. One case had been an uncomplicated luxation, the other had been associated with fracture of the humerus into the joint. The former case was of some months' standing, and did not prove amenable to treatment.

Luxation of the **proximal phalanx of the thumb** may require excision of the head of the metacarpal bone.

Of **congenital dislocations**, the most important is that of the head of the **femur**. The luxation may exist on one or both sides, and is more often found in girls than in boys.

The **signs** of the dislocation are not, in infancy, characteristic. The probability is that the lesion will pass unrecognised until the child begins to stand, when, from the centre of gravity being in advance of the normal line of support, the equilibrium will be unstable. If luxation be symmetrical, the child develops incurvation in the loins (lordosis) in order that the centre of gravity of the body may be restored to the proper situation by bringing the upper part of

* "Annals of Surgery," August, 1885.

the body well backwards. (But if the deformity be unilateral the thigh of that side will be found small and flabby.) Thus the abdomen is rendered prominent, and the buttocks are large and salient. When the subject is in the horizontal position, the chief characteristics of the luxation become effaced. Where the affection is unilateral, there may be difficulty in forming a positive diagnosis. The child walks with a reeling gait. The chief points in the *differential diagnosis* are the absence of pain both in the knee and in the hip; the shortened limb may be drawn down to the normal length by steady traction, the child showing no evidence of distress; the thigh bone can be rolled and everted in its bed upon the dorsum of the ilium. The top of the great trochanter is found above the line which is drawn round the buttock from the anterior superior spine of the ilium to the tuberosity of the ischium. The lordosis is best marked when the lesion is symmetrical, the abdomen and the buttocks being then extremely prominent, as shown in Fig. 69; and on account of the shortness and the small girth of the lower limbs, the upper part of the child's body appears disproportionately large.

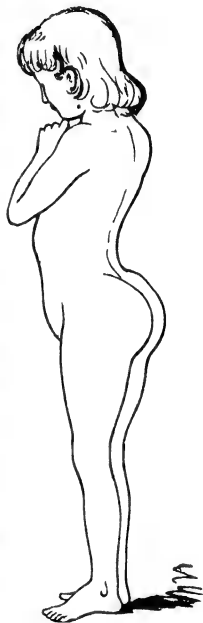


Fig. 69.—Congenital location of Femora.
(After Brodhurst.)

A simple and exact way of comparing the length of the lower extremities in this or any other condition is to lay the child flat upon the back, with the pelvis

squared, and, having straightened the knees, to bring the soles of the feet up towards the ceiling. The difference in the level of the heels and the malleoli becomes at once apparent.

Pathological anatomy.—As a considerable proportion of the subjects of this lesion have entered the world breech first, it has been suggested that the displacement may have resulted from the thigh being hooked down by the accoucheur. But this theory is not proved; there has been, moreover, no tenderness detected at the hip joint after birth: and I have met with one such case in which a child came breech first into the world, but without any external assistance. Neither can the lesion be explained, I think, by the theory of intra-uterine arthritis. It is probable that the imperfect development of the joint is the result of a vicious packing of the fœtus in utero, the legs being extended on the thighs, and the thighs flexed upon the abdomen.

Dissection shows the head of the femur, though mis-shapen, enclosed within the capsular ligament, (a fact which disposes of the theory of traumatic dislocation), the acetabulum is undeveloped, triangular, shallow, and rimless. It is more convenient than correct to speak of the lesion as a *dislocation* of the femur.

The **differential diagnosis** is from true hip-joint disease (page 431) and infantile paralysis. In the former condition the thigh will be kept rigidly fixed, probably in the flexed position, and any attempt at eversion of the limb, whilst the pelvis is fixed, will be attended with pain and distress. From the effects of infantile paralysis the diagnosis is not difficult, as, after paralysis, the movements at the joint are all free. In "dislocation" the trochanter can be thrust up and drawn down in a very characteristic manner. In every case the history will afford help.

Treatment.—The displacement is usually diagnosed only as the child begins to walk. If the deformity be unilateral, the wearing of a raised boot may improve the power of walking; it will also be necessary to prevent the invasion or increase of lateral spinal curvature (page 377). The inconvenience of the deformity is not sufficient to warrant the resort to any speculative operation, with the view of improving the position of the undeveloped femoral head. I have at present under supervision a grown girl with congenital luxation, and by keeping the boot raised in proportion with her growth, the ill effects of the deformity are little noticeable. No doubt her condition is now as satisfactory as it would have been had the limb in early childhood been subjected to months or years of continuous and vexatious extension. By carefully drilling her as she walks, much of the effect of the displacement may be overcome; indeed, she may eventually show but slight lameness.

In comparison with that of the hip joint, no other congenital displacement is possessed of much practical importance. Rarely the **tibia** is found partially **displaced forwards** upon the femoral condyles at birth, the toes pointing towards the infant's face. But little difficulty will be found in bringing the leg down straight, and this being done, the knee should be kept extended on a well-padded splint. Subsequently, rubbings and shampoos will render the joint sound and trustworthy.

I have seen one well-marked instance of congenital dislocation of each **radius backwards**. The head of the bone lay quite behind the lower end of the humerus; the lesion but little affected the strength of the joint. The luxation, if noticed soon after birth, might be reduced, but no cutting operation need be undertaken for its improvement.

Congenital dislocation of the patella.—

With knock-kneed children, the patella is necessarily displaced considerably outwards. In the case of the congenital dislocation, attention may be drawn to the condition only after the receipt of some accident.*

CHAPTER XXIX.**HIP-JOINT DISEASE.**

THE term hip-joint disease is convenient in that it conveys a definite idea of one or more of a series of pathological changes which frequently affect that joint in childhood. It should not suggest, however, that these morbid conditions differ from those which may ordinarily be found in other articulations. Whatever the stage of the disease, stiffness of the joint will be always the chief objective sign. The disease may be started by a strain of the round ligament, or may begin as a strumous or tubercular osteitis or synovitis. The head, the intra-articular part of the diaphysis, or the junction-cartilage may be attacked: in the last instance the head of the bone is cast adrift in the interior of the capsule, where, on exploring the joint, or performing excision, it may be found bathed in pus, and much eroded.

Though one cannot affirm that hip-joint disease is invariably the result of some remembered or forgotten injury, still, by careful questioning, one can very often learn that some weeks or months before the trouble began the child received a special hurt from a fall from the bed, a fall down stairs, or from a bench at

* See Trans. Clin. Soc., Oct., 1884.

school, or that he was pushed down the steps by some boy as he was hurrying out from school. But, on the other hand, one may find the joint attacked in a patient who for a year or two has been bed-ridden and unexposed to any chance of injury. In a notable instance, just as one hip joint was becoming convalescent after very prolonged treatment, the other was attacked; in a second case the disease began after the boy had been two years or more under treatment for knee-joint disease. Sometimes the disease is due to the exhaustion following one of the exanthemata.

Mechanics of the disease.—If at the time of the accident the boy falls on to the outside of the partially flexed thigh (a very likely contingency), the ligamentum teres is submitted to serious strain.

The course of the pathological events in the case of a sprained ligamentum teres cannot be followed as closely as can those of a sprained ligament of the ankle joint; but, from analogy, one can, in the mind's eye, see the ligamentum teres slightly injected after its rough usage. Then its substance is infiltrated with inflammatory exudation, and permeated with leucocytes, whilst the synovial membrane, which is virtually incorporated with it, is participating in the morbid changes.

The ligament, which is now swollen and tender, can no longer lodge in happy disregard of the movements which take place between the head of the femur and the depths of the acetabulum. Two conditions are therefore demanded: first, that the head of the femur shall be so placed in the acetabulum as to exert the least possible pressure against the swollen ligament; secondly, that there shall be no sudden movement at the joint by which any bruising of the tender tissue may occur.

The first provision is obtained by the thigh becoming slightly flexed, for then the strong and unyielding part

of the capsular ligament is rendered slack. The posterior part of the capsule is of no mechanical importance, whilst the anterior part is extremely thick (so that it may prevent the head of the femur leaving the front of the joint in violent extension). In flexion of the limb, this strong part of the capsule is loose, and the head of the femur lies gently against the bottom of the socket; the more that the ligament is tightened, as happens in extension of the limb, the more firmly is the femur forced against the floor of the socket.

The provision against sudden and jarring movements is accomplished by the muscles at the front of the joint being kept on the alert against interference from without. They are thrown by reflex influence into a state of watchful and shielding tension.

Just as the shrouds ascend from the hull of the ship to the head of the mast to steady it, so do these muscles, from the tensor fasciæ femoris on the outer side to the adductor longus on the inner, concur in the fixation of the thigh bone. Probably the most important service in this respect is rendered by the mass of the psoas and iliacus.

As the synovial membrane becomes implicated, a considerable increase of its secretion takes place, so that a painful tension of the fibrous capsule occurs. How will the hip joint arrange itself so as most comfortably to accommodate this increase of fluid? The question is answered by this experiment: When fluid is injected with a syringe from the pelvic side into the interior of a freshly dissected hip joint, the first amount causes the femur to pass into the position of slight abduction, whilst a further injection determines its flexion towards the abdomen. From this it must be inferred that the greatest capacity of the joint is obtained, first, when the thigh is slightly abducted, and next when it is carried into flexion. It is to a large extent the effusion into the capsule which, in this

stage of the disease, causes the fixedness of the limb. This also may be demonstrated by injection of the dissected joint, as well as by the effect of puncturing the capsule in the case of acute effusion (as detailed on page 445), when the position of the limb may be straightway improved or altogether corrected.

In the early days of hip-joint disease, when the fluid is beginning to accumulate, the thigh may now and then be found in the position of slight abduction ; but abduction passes so quickly into flexion as to go unnoticed ; or it may be obscured by the flexion. I do not imply that the sero-synovial fluid of the inflamed joint *forces* the limb into these positions ; but that, by the assumption of these positions the painful intra-articular tension is reduced to a minimum.

After flexion has accomplished its utmost in the diminution of the joint tension, and the anterior muscles are found by the timid patient to be insufficient in shielding the inflamed area against accidental shocks from without or muscular startings from within, comfort will be obtained by resting the knee of the diseased side over the front of the opposite thigh ; and, further, by bringing it on to the front of the abdomen, or even up on to the chest itself, where the child can further steady it with his hands and arms, and with his chin. He has usually passed through intense and prolonged suffering before the limb has been compelled to take up this position of extreme flexion, adduction, and inversion.

Pain in hip-joint disease is apt, like the cry of the plover, to decoy one from the object of the search. As a rule, and certainly so at the beginning of the trouble, it is located at the knee joint, over the patella, or along the front or the inner side of the thigh : that is, in the area of distribution of the terminal filaments of the obturator nerve. One filament of the obturator nerve has entered the hip joint for the supply of the

or upon the table or floor. The diseased joint being stiff, and partially flexed, it follows that when both thighs are brought flat down a compensating excavation (Fig. 70) is established at the loins, beneath which the hand can be easily passed. This loin arch can be effaced by raising the knee (Fig. 71). The cause of this important diagnostic measure is, that the thigh being advanced and rigidly fixed at the acetabulum, a vicarious but serviceable joint has been developed in the

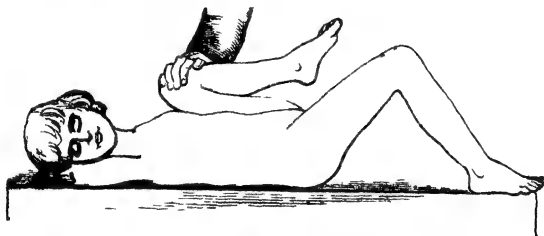


Fig. 72.—Sound Thigh flexed on Abdomen for ascertaining exact amount of Deformity.

lumbar region, the rigid system of femur and pelvis becoming capable of greatly increased flexion and extension on the spine. When the loins are flat upon the table, and the pelvis is squared, the amount of the fixed flexion becomes manifest. So as to be certain that the loins and pelvis are flat and square, the sound thigh should be fully flexed upon the chest; and when this is done the precise amount of flexion and adduction is shown in an unmistakable manner (Fig. 72).

Deformity.—As soon as the pelvis is brought square with the spine, and the lumbar vertebræ are all flat upon the table, the amount of deformity is accurately determined. Apparent shortening is then explained, and a limb which hitherto might have

been considered to be in good position, may be found of normal length, but flexed and greatly adducted.

These schemes represent (A) pelvis and lower extremities in every respect normal ; (B) disease of the left hip joint, tilting of the pelvis, the left limb being apparently shortened but in the normal line ; (C) shows how, by the squaring of the pelvis, the limb has been brought down and found greatly adducted, yet of normal length ; (D) represents disease of the left joint,

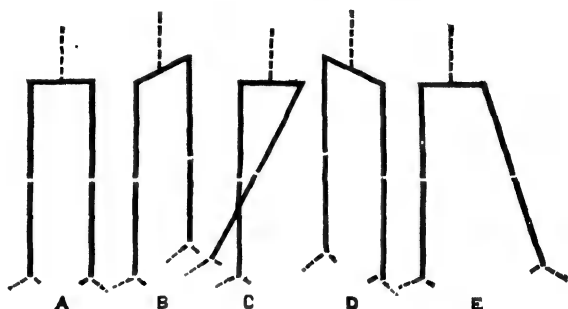


Fig. 73.

the pelvis having been tilted (possibly dropping from want of the accustomed support), so that the left extremity seems increased in length, though still in normal parallelism. But on bringing the transverse line of the iliac crests at right angles with the spinal column as in (E), the left limb is found of normal length but greatly abducted. Fig. 72 shows the method of squaring the pelvis.

This merely shows that the hip joint is stiff, but the stiffness may be due to abscess in the sheath of the psoas or iliacus, and certain other conditions from which a differential diagnosis must be made. This is done by flexing the thigh of the

damaged side a little farther, and then gently rotating it. Sometimes a child will bravely endure the pain as long as possible, and then burst out crying; so during this manœuvre the face must be watched for the slightest expression of pain; if he become hurt or frightened the value of the examination is destroyed. Unlike adults, children cannot generally give much definite information as regards pain, but, on the other hand, their complaints always demand careful consideration. The oft-repeated cry of "My leg does ache!" should not be disregarded. If the child allow the head of the femur to be gently rotated in the acetabulum without complaint or expression of pain, there is no disease of the articulation; cause for the stiffness must be sought elsewhere.

Differential diagnosis.—If, when the thigh has been partially flexed, rotation is permitted, the stiffness may be due to spinal or iliac abscess rendering the sheath of the psoas or iliacus full and tense (page 259); inflammation of the bursa, which intervenes between the psoas tendon and the capsule of the joint; perityphlitis (page 350); gluteal or other extra-articular abscess; periostitis of the upper end of the femur (page 389); congenital displacement of the femur (page 422); or to infantile paralysis (page 165).

If, when the subject of diseased hip is lying on the back, a gentle attempt be made to abduct and rotate the thigh outwards, the pelvis and the whole body will follow the guiding movements rather than allow a disturbance between the femur and the acetabulum. (For sacro-iliac disease *see* page 459.)

To obtain the confidence of the little patient, the examination should always be gone through first with the sound limb.

Supplemental signs of the disease may be fulness beneath the middle of Poupert's ligament, due to intra-articular effusion; a flattening and widening

of the buttock, together with a dropping of the gluteal fold, and a loss of symmetry where the line of the gluteal fold meets the median line of the body. The widening of the buttock is due to the slight thrusting out of the head of the femur from the depths of the acetabulum by the intra-articular effusion ; it may be imitated on the cadaver. The flattening is due partly to the widening of the buttock, but chiefly to atrophy of the gluteal muscles ; not merely from want of use, but to some peculiar trophic change, the nature of which is, perhaps, not thoroughly understood. The alteration in the gluteal fold is partly due also to the slight flexion of the thigh. The fulness beneath Poupart's ligament may be partly due to secondary effusion into the subpsaos bursa.

Treatment.—With the least suspicion of disease, the surgeon should never be content to await the further development of signs before inaugurating treatment.

Even if he think the boy has but “sprained” the joint he should at once put him to bed and apply the stirrup and weight ; only having done this should he assume the expectant attitude. Disappointment will follow the promise that the child will “grow out of” his obscure trouble. Treatment effects most in the early and apparently equivocal stages of the disease. When the symptoms are not sufficiently clear for absolute diagnosis the child should be kept in bed till every suspicious feature has passed off ; he must not be allowed to run about until the nature of the disease is evident even to the unskilled. Nor should the treatment at any period become

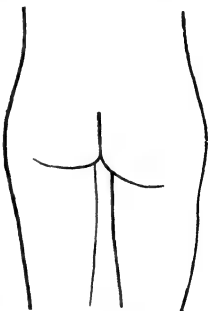


Fig. 74.—Disease of Right Hip Joint; Buttock widened and flattened, and gluteal fold dropped from normal level.

half-hearted, either because the child finds it irksome, or because the surgeon has in distant view the alternative of excision.

Details may vary somewhat with the stage to which the disease has advanced, but the principles are unchanging; they are the insurance of absolute, uninterrupted rest for the joint, and correction of the deformity. As a rule, the only drugs required will be cod-liver oil, iron, quinine, and an occasional laxative. The oil should be given in small doses, and not persisted in if it make the child sick. In large doses it may cause diarrhœa.

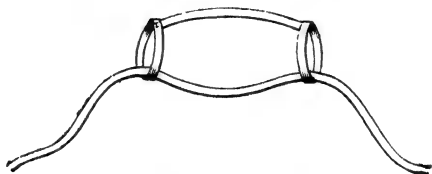


Fig. 74A.—Armlets for keeping a child flat in bed; the long band is run through the shoulder-loops and behind the child's shoulder-blades, and its ends are secured to the sides of the bed under the mattress.

In the early days, though perhaps there is nothing worse than a little effusion, and signs are slight, confinement in bed is urgently required. Even if no other sign of the disease exist than that of obscure pains in the limb, and an unwillingness to have the thigh moved, there may be little doubt as to the presence of incipient disease. Hip-joint disease would not be so desperate and often intractable a complaint if only it were diagnosed, and methodically dealt with, in the early part of its course.

Occasional paroxysms of pain may be relieved by the application of a blister near the region of the joint, but though this is very rarely required it may sometimes put an end to the pains which have been disturbing the child's sleep.

When confined in bed, the child should *never be allowed to sit up*, for that would be to flex the pelvis on the femur. He must be kept absolutely flat, and should be allowed but a thin pillow. If he will not submit to the horizontal position, it may be enforced by the application of appropriate armlets, consisting of two small circles of webbing, which are run over the arms and up to the shoulders, and fixed together by a short band of like material, which passes across the front of the chest. Then a long piece of roller bandage or webbing is run through them, across the back of the shoulders, and secured to the frame of the bed (Fig. 74A). If the "harness" be covered with some bright stuff, the child may fail to discover the nature of the fetters, or, at any rate, may submit to them more readily.

Weight and pulley.—Every case of hip-joint disease should, from the very beginning, be treated by means of Thomas's splint; but, unfortunately, parents are often too poor to find the fifteen or eighteen shillings necessary for the purpose. In private practice I invariably begin treatment with that splint. But in those cases in which it is not procurable, excellent fixation may be obtained by a weight of from three to eight pounds, suspended from the leg (Fig. 75)—one pound for each year up to the sixth.

To apply the stirrup, a strip of Leslie's soap strapping is cut, long enough to form an ample loop below the foot, and to reach up on each side of the leg to a little below the knee. The strip is narrowest in the middle, and there, upon the adhesive side, is laid a slip of deal, three inches long by two wide, with a hole bored through the middle. Extending for a few inches beyond the ends of this piece of wood is placed another strip of strapping, with the adhesive surface towards that of the other slip, the

wood being between them. This second strip is to prevent the loop of the longer one adhering to and irritating the malleoli when the stirrup is fixed, and also for securing the wood. The wood is for holding the strapping away from the sides of the foot and ankle. Before applying the long strip to the leg, the ends may be notched, to make it fit closer. When adjusted, it should be secured by a soft roller, the weight being applied when the strapping has obtained a firm hold. Then the cord is passed through the

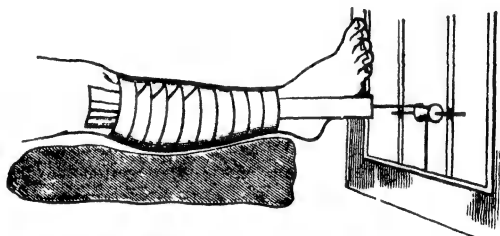


Fig. 75.—Stirrup applied. Leg raised on pillow.

strapping and wood, a knot is made at the upper end of the cord, and a weight or shot-bag is hung at the other, the cord being passed over a pulley. The pulley may be made of a cotton-reel, which has running through its axis a steel knitting-needle, which is to be firmly fixed to two of the upright bars of the cot, at the proper level.

With a little ingenuity, a convenient bed may be made of a narrow board, on which is laid a thin mattress. To the end of the board a short upright bar, with a pulley, is screwed. This arrangement is handy for travelling; and daily the child can be taken out of doors upon it. In the house it can be rested on two chairs.

The traction must always be in the axis of the

femur ; if it be arranged only in the axis of the body, the apparent improvement in position is obtained by a still further tilting of the pelvis, or by arching of the loins. From time to time, as the thigh can be brought flatter without arching the loins, the pulley must also be lowered.

When there is so much flexion of the thigh that the pulley has to be considerably raised in order to keep the traction in the line of the thigh, a wedge-shaped pillow may be placed beneath the leg, for the sake of support ; it will be made thinner as the limb comes down (Fig. 75). A bed-cradle is needed to keep the weight of the clothes from the toes ; every morning the foot should be gently but fully flexed.

Appreciation.—The weight and pulley have great effect in subduing pain and correcting deformity ; the former is accomplished by the rest assured to the joint and to the apprehensive muscles. The weight does not draw the head of the femur from out of the acetabulum ; this is rendered mechanically impossible by the strong anterior part of the capsular ligament, as experimentation on the cadaver proves. The head of the bone might be drawn somewhat out of the socket if at the same time the flexion were increased, but in its effort at bringing down the limb the strain is brought to bear on the front of the capsule. The weight upon the leg thrusts the femur farther into the socket, and increases the intra-articular pressure, but the compression is so even and steady that it is comforting to the inflamed joint, and promotes absorption, just as the external compression may do in the case of effusion in the knee joint.

Thomas's splint consists of a flat piece of malleable iron $\frac{3}{4}$ in. \times $\frac{3}{8}$ in., and long enough to extend from the level of the inferior angle of the scapula, down the loins and pelvis, between the great trochanter and ischial tuberosity, and to the bottom

of the calf. If the thigh be but little displaced, only slight bending of the bar will be required to make it lie easily along these surfaces (Fig. 77). But it must be clearly understood that the splint is to be moulded to the limb in its faulty position, and that the limb is never to be forced down to fit the splint. Sometimes,



Fig. 76.—Method of lifting Child with Hip-Joint Disease, in Thomas's Splint.

therefore, the splint has to be wrenched very considerably into the position of flexion and inversion; but, under the influence of the rest which is thus secured, the deformity steadily diminishes and the splint is gradually straightened.

For converting the bar into a splint three cross pieces of iron are riveted on, one at the top which is to be bent around the chest, a second to grasp, but not to encircle, the upper part of the thigh, and a third to receive the leg. These cross bars are of hoop metal, so that they may be easily bent; steel will not do. The metal frame is then padded with a single layer of boiler-felt, and covered with basil leather.

The mattress on which the child is laid should not be so hard that the splint is pressed unfairly against the skin.

The splint secures the joint against all chance of

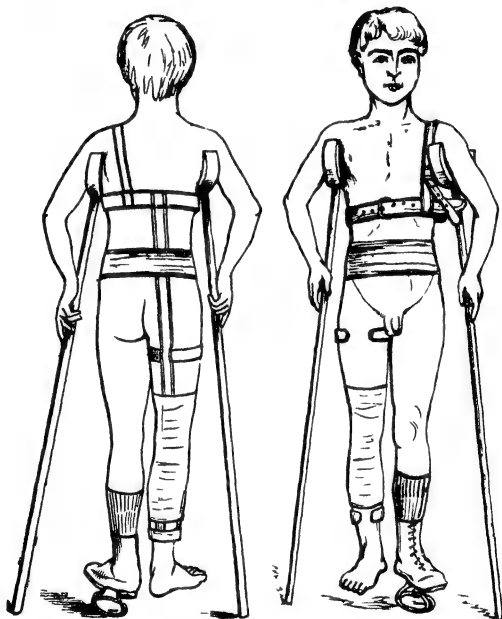


Fig. 77.—Disease of Right Hip Joint, splint applied; patten beneath foot of sound side.

movement, for it fixes the trunk as well as the limb it is light, and fits close to the body, which rests comfortably upon it, the patient being secured within it by straps and buckles and by soft bandages. The splint may be covered from time to time with a strip of old soft linen; this will give comfort to the child.

The greater the deformity, the more, of course, must the splint be bent around the buttock; but after the apprehensive muscles have enjoyed a few days' rest, the thigh can be brought down flatter without any arching of the loins.

Whilst undergoing treatment, the patient and splint may be conveniently carried from room to room, or out into the fresh air, by any one who has had a little experience in the lifting. Fig. 76 shows the



Fig. 78. — Iron Patten, to be screwed to sole of boot of sound foot.

manner of lifting, and how securely the joint is protected as the patient is moved.

High amongst the advantages of the method of Thomas is this, that when the limb has been brought down straight, even though disease be only just becoming quiescent, the patient may be taught to walk out, and even attend school, without interference with the progress of the cure. This is accomplished by raising the sound foot four or five inches, by a clog or patten fixed beneath the boot. It is

important that the strumous child (and many subjects of hip-joint disease are strumous) should be able to enjoy the fresh air and sunshine, and even take exercise, whilst the cure is being wrought. "I wish I had words at my command," says Macnamara, "to express my strong feelings regarding the importance of allowing patients suffering from incipient symptoms of tubercular disease of the bones to move about without injurious pressure on the affected tissues. It is a pitiful sight to see patients of this kind confined in the close rooms, or the wards of our London hospitals, at rest, until they have passed into a hopeless condition of general ill-health."

Having used the splint many years, and in cases of every stage of the disease, and in all sorts of patients, from the diffident girl to the heedless boy, I

affirm that the more I see of its working the more highly do I appreciate it. My experience is, that however rough and active a boy may be, he is always particularly careful about the way he treats his weak limb. That he may now and then get a fall or a hurt must be admitted ; but the limb is fixed so securely that a day or two in bed will generally suffice to put matters right again ; after this he is more careful than ever. But for Thomas's splint, scores of unhappy children would to-day be still in bed, who are now in the fresh air, and hurrying on the progress of cure. Lastly, the more that the splint is used, the less becomes the probability of excision or disarticulation ; of this I feel confident.

Any splint designed to allow some movement at the joint during the treatment must be wrong in principle and unsatisfactory in practice. The demand for absolute rest for the inflamed joint is as urgent as is the absolute darkness to which the patient with acute retinitis is consigned.

When may the splint be left off? is a question which is often put in the progress of the case ; the best answer is, "When the child is well." Relapse is often the direct result of discarding it too early. The prolonged wearing of the splint is not the cause of the ankylosis which may follow its lengthy employment ; I have seen a child recover with free movement in the joint after continuous wearing of the splint for several years. When all deformity and pain have passed away the splint may be remitted at night, and then gradually the child may go about without it in the day, his high boot or clog, and crutches, protecting the weak limb. And so, as he walks and sits about, the movement will gradually return if the function of the joint have not been destroyed in the course of the inflammation. Prolonged rest of the joint is not of itself sufficient to leave it permanently stiffened. On no account,

therefore, should movement be imparted during the treatment; the rest must be "absolute and uninterrupted." When criticising the treatment by extension-and-movement, Thomas suggests that "the best commentary upon this method is the remarkable frequency with which its principal advocate has had to perform excision of the joint."

The surgeon must be cautious in pronouncing recovery from hip-joint disease as complete. There is always a great risk of the rest-treatment being discontinued too soon; as convalescence advances the parents are apt to importune for release from the splint. One very cheering sign is when, on the surgeon attempting to move the thigh, the adductor longus and the other muscles no longer throw themselves into apprehensive contraction. This is an indication either that the disease is at an end or that a serviceable ankylosis is taking place. At first the splint may be left off when the child is put in bed, once a week, twice a week, every other night, and, lastly, if all go on well, every night. Then it may be left off for an hour every afternoon, as a reward for careful and obedient behaviour. Gradually, all going on well, the child may discard it every Sunday, twice a week, every other day, going about with the high boot on the sound limb, and with the crutch. Then he may leave the splint altogether, using still the high boot and crutch. Eventually the boot may be lowered and the crutch shortened. At last the boy finds his patience rewarded by all restraint being taken away. During this period of approbation *chi va piano va sano* applies with equal force to surgeon and patient. Each time that the child is brought for inspection the surgeon should examine him after the method illustrated on page 432; when, if the lordosis be found to be increasing, or if the child wince as the thigh is abducted or rotated, the joint must be absolutely fixed

again, for it is certain that the disease is not yet at an end.

Distension of the capsule.—There is a peculiar springy resistance in the limb which is fixed by acute effusion in the capsule, and there is generally a distinct bulging to be made out about the head of the femur. The puncture may be made through the gluteus maximus, and into the back of the joint, or by working inwards from below the anterior superior spine of the ilium. On account of the position of large vessels the joint should not be tapped from the front. The prompt relief of the acutely distended joint is an important therapeutic measure. One does not hesitate to aspirate the acutely distended knee, and why should there be so much delay in the case of the hip? I strongly urge the practitioner in every case to look out for a fulness at the base of Scarpa's triangle, and for a doughy swelling between the trochanter and the ischial tuberosity, and to explore it with a clean canula and trocar. In careful hands the operation is devoid of risk, and it may prove of great value, enabling the surgeon to bring down a limb which, previous to the paracentesis, seemed to be resolutely fixed. (*Trans. Internat. Med. Cong. Washington, 1887, sec. ii. p. 563.*)

Abscess is a frequent complication. It may come on quietly, without local or constitutional disturbance. Or it may supervene rapidly, with intense pain. There may be sleeplessness, loss of appetite, and convulsions: the rigors of childhood. At the same time the hip is swollen and extremely tender; the axillary temperature rises. If increasing pain and swelling suddenly subside, the thin posterior part of the capsule has probably yielded to the pressure of the suppuration.

On the formation of pus, the limb, if previously in good position, though not on the splint, becomes rigidly flexed. On puncturing the capsule with canula and

trocar painful tension may be relieved, and an improved position of the limb obtained.

When definite suppuration has taken place, and is coming towards the surface (the capsule having probably given way), the pus should be withdrawn by several aspirations, undertaken at short intervals; a single aspiration will rarely suffice. If the pus find its way along the course of the trocar-wound, the abscess cavity should be laid freely open, thoroughly washed with antiseptic solution, and provision made for drainage; a thick pad of mercuric wool or carbolised tow makes an excellent dressing. The Thomas's splint, which should be worn all the time, may be protected from the discharge by a little waterproof covering. If the abscess increase quickly, the sooner that it is evacuated the better; otherwise a painful and destructive infiltration of pus occurs.

The farther that a chronic abscess wanders down the thigh before coming towards the skin the better is generally the result. After the aspiration, the thigh should be firmly compressed by a roller bandage, applied over an ample pad of carbolised tow. A favourite place for pointing is near the great trochanter, that is, in front of the cover of the gluteal muscles. Some few abscesses reach the surface just below the middle of Poupart's ligament. The opening of abscess through the front, thick part of the capsule is of rare occurrence. Nevertheless, pelvic abscess is sometimes due to the escape of pus through the front of the capsule into the large subpsoas bursa. Exploration by the rectum at once shows that such suppuration is not due to perforation of the acetabulum.

Case.—A child had been for some time under treatment when suppuration occurred at the base of Scarpa's triangle. On opening the abscess, an aperture, of the diameter of a pea, was found in the strong and healthy-looking capsule, and through it the movements

of the smooth head of the femur could be seen and felt. The abscess had burst through the perforation by which the bursa of the psoas communicated with the synovial membrane of the joint; excision was performed, and the abscess was successfully drained through the buttock.

Trephining the great trochanter to evacuate a hip-abscess does not commend itself to me; it were better, I should think, to open the joint freely and, if necessary, to resect the head of the femur.

Straightening under chloroform may be resorted to in some few old-standing cases, where the deformity is being kept up by fibrous adhesions rather than by intra-articular effusion or muscular contraction. It should be undertaken with gentleness, and not to the full extent on the one occasion. But, gently as it may be done, it is very apt to be followed by the formation of abscess. In some cases, however, a little help is required just to start the improvement. Bone-setters do infinite harm in attempting to "put in" such "dislocated" hips. In one case, from empirical manipulation, the head of the femur was thrust right into the pelvis, this fact being revealed at the autopsy.

Subcutaneous division of the tendon of the adductor longus or of the tensor fasciæ femoris need rarely be resorted to, if the use of the weight extension or of Thomas's splint be efficiently carried out.

In direct opposition to what I had long believed and taught, I am now convinced that **dislocation of the femur**, from hip-joint disease, is an extremely rare occurrence. Thomas goes so far as to say that he has never met with an instance of genuine dislocation from disease. Certainly the upper border of the great trochanter may often be found above Nélaton's line, whilst the shortened, flexed, and inverted position of the limb appears highly characteristic of the dislocation.

But this may generally be accounted for by the diseased and undeveloped condition of the head and neck of the femur, the ulcerated state of the acetabulum, and by the chronic inflammatory thickening about the joint. On occasions in which the appearances of dislocation have been apparently unequivocal, and in which excision has thereon been performed, the joint has been found open behind, and with hardly any femoral head or neck existing.

Prognosis.—Months or years may pass before the disease has entirely disappeared, whilst however prompt and efficient the treatment may have been, some deformity may remain. Children may recover absolutely from the disease; but in such cases the constitution has generally been good, the disease vigorously treated, and the supervision long continued. But even after long-continued suppuration the abscesses may heal, and freedom of movement ultimately return to the joint; this is particularly likely to supervene when the case has been one of suppurative synovitis rather than arthritis. Perhaps the disease will end in true ankylosis, when, if the limb be in a good position, the result must be considered as satisfactory. Abscess may form, and the patient sink from exhaustion or intercurrent disease; or albuminuria may occur from amyloid degeneration. Tubercular meningitis is a not uncommon ending of the suppurative disease (page 66).

Permanent shortening of the limb is apt to follow even the most skilful treatment of the disease. There may have been no formation of abscess during the months or years of absolute rest, yet it may be inevitable that the diseased limb is shortened by as much as one, two, or three inches. The cause of the shortening is the interference with the nutrition of the epiphysis, and a consequent arrest of development. Sometimes the shortening is associated with slight or

considerable inversion of the limb. Such version might have been amenable to treatment at its onset, but it should then be dealt with gently, never with violence, lest acute suppuration or separation of the epiphysis result. The possible occurrence of deformity should be thoroughly recognised at the outset of treatment, lest disappointment or even unjust reproach be entailed. *Caries sicca* may cause absorption of the head of the femur without suppuration.

Synostosis in faulty position should not be interfered with directly the disease appears at an end; the patient's health should be improved, and the parts allowed to consolidate. The thigh must not be brought down by forcible manipulation, as this may awaken the old articular trouble. There are various plans of dividing subcutaneously the upper end of the femur. Keetley prefers to cut through the neighbourhood of the joint itself with an osteotome; others would rather keep away from the seat of the disease, dividing the femur with a slender but trustworthy saw, just below the great trochanter, washing the skin, and then puncturing it and the deep fascia with a clean tenotomy knife. The course for the saw-blade through the muscles is cleared by a firm director. When the section of the bone is almost completed, a sudden and sharp jerk finishes the operation. Dry dressing and a splint are then applied. No attempt should be made at keeping up a false joint. Absolute cleanliness during the operation and at the subsequent dressing is, of course, demanded. I have performed this latter operation very frequently, and have every reason to speak well of it.

Double hip-joint disease.—In several cases, the second joint has become quietly affected when the child has been lying many months in a position of perfect rest. Such children are best treated by Thomas's double apparatus. The limbs must be placed

in the straight position, for should ankylosis supervene in an adducted position, progression would ultimately be accomplished with great inconvenience and unsightliness. This **scissor-legged deformity** is, fortunately, rare. (Trans. Clin. Soc., 1881.)

In the case of double hip-joint disease the existence of some such condition as that which is conveniently termed "struma" (page 60) is forcibly demonstrated. It is unlikely that on each side the disease should be of simple traumatic origin. Moreover, we frequently meet with the co-existence of hip and spine disease, of hip and knee disease, of hip and elbow disease, and so on. In the strumous child bones and joints are specially liable to inflammation.

Excision affords the only chance of recovery in certain advanced cases. Statistics are not satisfactory, but this fact should not restrain the surgeon when the patient's condition demands the adoption of heroic measures. Each case must be treated on its merits, and no array of figures as to the results of excision should influence the question; for joints may have been excised which might have been treated less rigorously, whilst others are left uninterfered with until the child is past all surgery. The truth lies somewhere between these extremes. But the truth seems to be more difficult of discovery in connection with the subject of excision of joints than in any other department of operative surgery, and for various and obvious reasons. Thus, some surgeons excise too early, and show "good" results, almost as good, perhaps, as if their energy had been expended in helping Nature in working her own cure. Then, others, disliking the operation, resect too late. Lastly, the "good results" are always exhibited and described, and, as a rule, far too soon after the operation; but, months afterwards, chronic suppuration recurring, amputation may have to be resorted to; or, at the best, the youth, growing up,

requires to have the foot of the wasted limb raised by a patten of six inches or more.

When the local and constitutional disturbance of a suppurating joint is becoming greater than the child can bear, excision may bring immediate relief, the temperature falling straightway, and convalescence setting in. One great recommendation for excision is that it insures the thorough drainage of the suppurating cavity.

Albuminuria, and the presence of a large, hard liver, should be taken as a suggestion rather than as a contra-indication for operation; these symptoms may entirely disappear after relief has been afforded to the articular disease.

On the other hand, a child whom one has long watched becoming daily feebler from exhausting discharge, suddenly takes a turn for the better without special interference, and convalescence is established and eventually completed. These happy instances are not of frequent occurrence; but they are met with, and occasionally in those inconvenient circumstances when the surgeon has committed himself to positive statement that no treatment, short of excision, can avail in saving the child's life (page 448). It is never advisable to make so positive a prognosis; it may be that on the child being removed from the care of the surgeon an abscess bursts, or a sequestrum is cast off, or some tubercular infiltration in bone undergoes caseation; and perfect rest being still maintained, and drainage provided for, under the beneficial influence of change of air and scene, the unexpected improvement is inaugurated.

In the case of acute suppurative arthritis, when neither aspiration nor free incision has availed to diminish the grave local and constitutional disturbance, the prompt excision of the head of the femur is demanded. And as the pelvis in this instance is free of disease, and as the tissues surrounding the joint are

neither saturated with inflammatory effusion nor riddled with sinuses, a favourable result for the operation may be anticipated, both as regards the rapidity of the convalescence and the ultimate usefulness of the limb.

Excision is demanded also when the pus is finding its easy way into the pelvis through an ulceration in the depths of the acetabulum, as made out by digital examination through the rectum. Incipient phthisis is no contra-indication to the operation; indeed, the removal of a source of constant exhaustion (such as a diseased head of femur) may afford the child the only chance of triumphing over the lung disease.

When the patient is losing appetite, flesh, and vigour; when he is becoming pale or hectic; when his temperature chart is daily marked with lengthy ups and downs, or when bed-sores are appearing, something may have to be done. But simply because he is desperately bad, one should not stand by and refuse that chance of recovery, remote though it may seem to be, which excision may hold out. At least the operation ensures a free escape for discharge, and renders the socket accessible to antiseptic irrigation. I have sometimes been astonished at the way children have picked up after the operation; but, on the other hand, it often proves more than the already exhausted system can bear up against; but even then the fatal event has merely been advanced a little.

The **operation** should be conducted with as little cutting as possible, old sinuses being used whenever they may serve. Bleeding vessels should be secured with pressure forceps as quickly as they appear. The head of the bone, and the trochanter, may generally be detached by cutting forceps. But if, as often happens, the larger trochanteric epiphysis be detached as the raspatory is being used to clear the upper end of the femur, and it appear healthy, it had better be left with

its muscular connections uninterfered with. The operation of resection of the head of the bone should not be conducted in the casual manner in which one has often seen it done. The thigh and buttock should first be thoroughly cleansed, and every ulcer and fistula should be scraped out and disinfected. All vestiges of the diseased synovial membrane should be erased, and all granulation tissue and denuded osseous surfaces scraped over. In short, the operation should be performed with just as much care, zeal, and patience as one is in the habit of employing in an arthrectomy of the knee (page 476). The muscles and other tissues around the joint should not be disturbed more than is absolutely necessary. The construction of the hip-joint renders it unsuited for treatment by arthrectomy in chronic disease, but as a supplementary measure to resection of the head of the femur it is likely to prove of great value.

If sinuses do not serve for the excision-wound, the joint had better be attacked from behind, through the wasted gluteus maximus, as the posterior wound answers extremely well for drainage.

If necessary, the acetabulum may be gouged out. A large-sized drainage tube should be passed through the most depending part of the cavity, so that the wound may be kept sweet. When *acetabular disease* exists, gouging will be required, sequestra being picked out ; other small sequestra will be shed in due course. A few wire sutures may be required at the ends of the skin incision. The cavity should be stuffed with strips of lint which have been dipped in sanitas oil or sprinkled with iodoform, and a thick pad of salicylic wool and marine lint should be bandaged round the hip for the sake of compression. The limb may be fixed at rest by a stirrup and weight ; it is better not to apply a splint. A little opium and some wine may be required.

Next day the wound must be dressed under an anæsthetic, and much less stuffing left in the cavity. An excellent antiseptic lotion will be the iodine water decolorised by carbolic acid. Carbolic lotion should not be used too freely, as children often show great intolerance of it. Poultices should not be used. The compression should be readjusted and the dressings attended to as circumstances may suggest. Quinine and iron will be indicated, and as soon as possible the patient should be got on to the balcony or out of doors.

If, from the confinement to bed, the skin over the back become sore, the child may be kept for most of the day on his face, the bed being arranged so that he may see what is going on in the room. If the case succeed the boy will eventually be going about as depicted on page 441, the joint becoming firmly ankylosed. No attempt should be made at keeping up movement of the joint.

Mr. Barker has recently urged the adoption of **Hueter's anterior method of excising** in tubercular disease, attacking the joint from the front between the tensor fasciæ femoris and the glutei on the outer side, and the sartorius and rectus on the inner. The incision is begun just below the anterior superior iliac spine, and runs straight downwards and inwards for three or four inches. The lower inch or so should divide only the skin; the upper two-thirds should reach the neck of the femur at once. In this way the capsule is laid open vertically, and this opening can be enlarged by a little further dissection with the knife, care being taken, however, that the Y ligament is left as far as possible intact. The state of the joint having been now ascertained with the point of the index-finger, a narrow-bladed saw is introduced along the finger and the neck of the femur is divided from above downwards. Then the head is extracted

with a sequestrum forceps, and the acetabulum, if diseased, is carefully gouged out clean, or scraped thoroughly with a sharp spoon. Every trace of diseased synovial tissue discoverable is removed with scissors, knife, and sharp spoon, special care being also taken to clear out any caseating abscesses communicating with the joint. All this should be done with as little violence to surrounding tissues as possible, so that none of the tubercular *débris* shall be forced into the fresh-cut surfaces. When every portion of diseased tissue has been thoroughly removed, the cavity is freely flushed with a germicide solution until all loose particles have been washed away. It is then sponged dry from the bottom, and immediately dusted with iodoform, which may be carried farther into the ramifications of the cavity on the end of the finger. A small sponge is then introduced for the purpose not only of finally drying the part, but also of wiping away any excess of iodoform which may remain. This sponge should be left in until the sutures which close the wound are in position and are ready to be tied. It is then removed, and the threads are knotted, a medium-sized drain-tube being carried down as far as the acetabulum. A thick dressing of salicylic wool, arranged in strips so that interstices are left into which serum can escape, completes the operation.

The patient is much better without a splint of any kind: he simply lies on his back in bed, with the limb fully extended by pulley and weight; indeed, the latter may often be dispensed with altogether. The first dressing may usually remain undisturbed for some days, after which it is well to replace the serum-soaked wool by a fresh dressing of the same kind.

Except for the drain-opening, such wounds may heal by first intention. The fluid, moreover, after the first day or so, which comes from the drain-tube, is little more than thick odourless serum. It exudes

in very small quantity, and ought never to become truly purulent. This is the reason why the opening, although anterior, is perfectly adequate for the drainage of the cavity left by the operation.

Mr. Barker points out that this operation is not suited for those cases of chronic suppuration with sinuses. Indeed, he affirms that such are best treated by free incision and aseptic drainage; that "they are best left to Nature, and are unsuitable for excision." At first this has the appearance of being a somewhat doubtful compliment to the *vis medicatrix*; but when one finds the sort of cases which Mr. Barker picks out as suitable for his operation, the thought arises that his classification is not marked by magnanimity.

"Remembering that primary osseous disease of this joint is always limited at first to the head or its epiphysary growing line, it ought to be our object to interfere at a very early stage. If this is done, it will never be necessary to undertake those ghastly operations of former days. In the future, if we watch the early development of hip disease closely, we ought never to find it necessary to remove more than the head and part of the neck of the femur, and, in some cases, the central portion of the acetabulum."

Coming from so thoughtful a teacher and accomplished a surgeon as Mr. Barker, these statements are sure to attract attention, but it is not improbable that they will involve the risk of children with early hip disease being subjected to operation who might have made at least as complete a recovery under the well-tried treatment of absolute, continuous, and uninterrupted rest.

In one case of resection for tubercular disease of the femur I met with a strange condition. The interior of the head and neck came away as soft as fresh mortar, leaving the articular layer of the head, and the incrustation cartilage, securely lodged in the

acetabulum. The simulation of acetabular disease was perfect, and it was only at the *post-mortem* examination that it was discovered that the acetabulum was unaffected.

If, after the excision, the wound continue to discharge profusely, and the child do not emerge from the retrogressive course; if the albuminuria persist and appetite fail, whilst the shaft of the femur becomes swollen and tender, a still further chance may be afforded by amputation of the thigh.

The best method of **amputating at the hip joint** is a modification of Furneaux Jordan's:—The limb having been washed and raised to empty it of blood, an elastic tourniquet is applied as high up as possible. An assistant drags up the skin, grasping the thigh with the two hands, and the surgeon makes a clean circular sweep down to the femur, sawing the bone in the upper third. The chief vessels are easily tied on the flat surface of the stump, and the compression is gradually relaxed. Bleeding having ceased, an incision is made along the outer side of the stump, and the end of the femur is dug out by a strong raspatory, the periosteum being easily detached from it. In this way the loss of blood is diminished to the utmost, without the disadvantage of aortic or rectal compression.

The operation is simple; it entails comparatively little shock; it leaves a long stump, and in the periosteum bone may become developed, which may eventually prove useful in the support of an artificial limb (*Lancet*, 20th March, 1886).

CHAPTER XXX.

DISEASE OF THE SACRO-ILIAC JOINT.

SACRO-ILIAC disease comes on insidiously after a fall or other injury, especially in the unhealthy or strumous subject. In some cases there may be nothing to account for the onset of the trouble. Though it may be a primary affection, it is often secondary to disease of the vertebræ, os innominatum, or pelvis, but in any case it is a rare affection, even in tuberculous children.

Symptoms.—The child complains of feeling tired after exercise, and of his back aching. He walks with caution, so as not to jar the diseased articulation, and he does not care to run or stand about; he will not dare to jump. There is also a feeling of “weakness” about the back. The pain may be constant if the disease be advanced, and at all times a cough, a shake of the bed, or a stumble, greatly intensifies it. The pain being confined to the bottom of the back is an important point as regards the *differentiation* from disease of the spine and of the hip. In disease of the spine the pains are referred to the area of distribution of the nerves whose trunks pass by the carious region of the column (page 255): in disease of the hip joint the first pains are in the knee or thigh (page 429). If, however, the trunk of the obturator nerve happen to give a branch to the diseased sacro-iliac joint, there might be complaints of pain down the limb as in hip-joint disease. As in hip-joint disease, also, the limb is wasted; but on squaring the pelvis no alteration in the length of the limbs is found. The limb assumes no characteristic position, but most probably lies extended.

Further points in the differentiation from spinal

disease will be the absence of symmetrical pains in the thighs and legs (page 255), the absence of stiffness, straightness, or deformity (page 252) in the lumbar region. But the great feature in sacro-iliac disease is the pain on pressure over the neighbourhood of the posterior iliac spines, and possibly a puffiness of that region.

The differential diagnosis from hip-joint disease may be effected with certainty by flexing the thigh upon the abdomen and gently rotating the head of the femur in the acetabulum; also by gently abducting and at the same time everting the extended limb. No child with hip-joint disease would be able to submit to such examination. (*See* page 434.) But when the sacro-iliac disease has been caused by spinal caries the diagnosis may be obscured. Pains about the knee, it may be remarked, may be secondary to disease of spinal column, sacro-iliac joint, pelvis, hip, or of the knee itself.

On pressing the iliac crests together with the palms of the hands, or on cautiously thrusting them asunder by grasping the anterior iliac spines between the fingers and thumbs, the disturbance at the articulation of the haunch bone with the sacrum elicits complaints. Striking the heel or the great trochanter would cause pain, but as pain would also result were the case one of hip or spine disease, this rough method of diagnosis is useless. By tracing the iliac crest backwards, and following it to the neighbourhood of the posterior iliac spines the finger detects a spot where pressure causes deep-seated pain.

In the more advanced stage of the disease there is sometimes a localised puffy swelling at that part, and in time the skin over it becomes discoloured, and eventually yields to the pressure of the increasing abscess.

Treatment.—The child should be put to bed

and kept constantly in the prone position ; he must not be allowed to sit up, as that attitude disturbs the relative position of the sacrum and ilium. Thus the confinement is more strict than it might be for either disease of the spine or of the hip joint. If the weather be fine and warm, he may be carried out into the open air, if this can be done without disturbance of his position. With rest in bed, fretting pains will probably pass away ; but should they persist, two leeches might be applied over the tender spot, the patient being subsequently kept lying on his face. Possibly a belladonna plaister, or some form of counter-irritant might be found of service. For any neuralgic pains a touch or two with the thermo-cautery may afford relief. I doubt if much is gained by enclosing the pelvis in a stiff bandage whilst the child is being kept in bed, for there is practically no movement permitted at the joint, whilst the material used cannot but get in the way, and render the horizontal posture less pleasant. Armlets (page 436) and a stirrup may be useful in teaching a refractory patient the necessity of absolute quiet.

If after a certain duration of this treatment the progress of the disease be apparently arrested, and the patient be deemed sufficiently trustworthy for the purpose, he may be fitted with a Thomas's hip splint, and allowed to get about on crutches, as shown in Fig 77. When not on crutches, however, he should be kept lying flat on a couch or hearth-rug, and any return of the old pain should be taken as an indication that he ought to be put back to bed. To stave off suppuration is the great aim of the treatment. But if pus be detected it should be removed, as it is apt to find its way through into the interior of the pelvis, into the rectum, the ischio-rectal fossa, or the thigh. If for this purpose aspirations fail, a free opening should be made, and the abscess

dealt with on such principles as those enunciated under the heading "arthrectomy" (page 476).

The drugs will comprise cod-liver oil, iron, quinine, and possibly small doses of opium.

Prognosis is always grave if abscess supervene ; but if the child's health be good, and absolute rest in bed have been secured early in the course of the disease, the trouble may end ; and if abscess have formed, recovery can take place on the occurrence of ankylosis. Probably most museums contain a preparation of firm synostosis of the os innominatum and sacrum, the result of disease. Ankylosis of the joint scarcely, if at all, interferes with its subsequent usefulness. If abscess form, and continue to discharge, the child's health becomes undermined, and death is apt to follow from exhaustion, pneumonia, phthisis, metastatic abscess, from waxy degeneration of the kidneys and liver, or from general tuberculosis.

CHAPTER XXXI.

DISEASE OF THE KNEE JOINT.

THE bones entering into the formation of the knee joint are the femur, tibia, and patella. The synovial membrane which lubricates the surface is large, and much exposed to injury ; and being but little protected from the influences of cold and wet, it is particularly liable to suffer from inflammatory affections.

Purulent discharge from the urethra, vulva, or conjunctiva, or elsewhere, is very apt to cause pyæmic synovitis of the knee.

Acute synovitis is frequently met with after a fall, a wrench of the fibrous capsule, or after exposure to wet or cold. It may come on with extreme rapidity, the effusion of thin synovia into the articulation causing a peculiar elastic and fluctuating feel. The patella may be pushed forwards from off the trochlear surface of the femur. The distended capsule and the thickened membrane cause a fulness on each side of the patella, and on each side of the upper part of its ligament; there is also a great bulging, extending up for some distance under the quadriceps extensor. The depressions which are normally found at the knee are obliterated; this last may prove a delicate diagnostic sign, for it is often manifest before effusion into the joint can be detected by palpation.

Atrophy of the thigh and leg quickly supervenes, and the joint becomes permanently fixed. In estimating the amount of the muscular wasting in the case of a fat child, absolute measurement with a tape may give little or no tangible result. A better way of appreciating the flabby and wasted condition is by encircling the leg in the firm grasp of the finger and thumb, and carefully noting by how much the tips of those digits fail to meet, or overlap, and then comparing with the other side. (This style of measurement serves well also for the upper extremity.)

Position.—A partially flexed position gives the greatest room in the articulation, and it is invariably assumed. For the convenient maintenance of this attitude the limb is usually found lying supported along its outer side. The joint cannot be fully extended. Every movement from this easy position, especially that of slight extension, increases the intra-articular tension, and causes pain. Pressure with the finger also causes pain, the most tender spot being immediately below the internal condyle of the femur, as there the finger may be brought most nearly in

contact with the swollen membrane and the filling joint.

The skin over the joint is flushed and hot, and the general constitutional disturbance may be considerable, the child being sick and feverish; he may even be attacked with convulsions. He would walk with a limp, and would be easily tired; when standing he would support all his weight upon the opposite limb; and, the damaged knee being slightly bent, the toe of that side would gently touch the ground.

Acute inflammation may extend from the synovial membrane to the other articular structures, but often it is confined to the tissue in which it first begins. If in this stage one could briefly inspect the membrane, it would be seen pink from capillary engorgement, thickened from oedema, and bulging in swollen fringes in the lines of least resistance. The synovial fluid would be increased in quantity, thin and turbid, and perhaps flaky, or tinged with blood.

The **treatment** should be prompt and decided; the child must be put to bed, and absolute rest secured for the limb. Two or three leeches about the joint may give great relief, and an even pressure may be resorted to. This last may be accomplished by moulded mill-board splints, or by lateral splints of plaster of Paris, applied over a layer of wool; or the limb and knee may be evenly surrounded by a soft roller of domette or flannel. In any case a splint should be applied long enough to reach from near the ankle to the upper part of the thigh; restraining merely the region of the knee does not suffice to secure steadiness. The limb should be brought as straight as possible, and raised on a pillow.

If the intra-articular pressure and pain be great, careful aspiration may be resorted to before compression is applied. Neither lotions nor fomentations

can supply such valuable and permanent relief as an even compression. A few drops of tincture of opium may be given every hour till the pain is easier, the effect of the drug being carefully watched; the administration of a full dose of castor-oil or grey powder may be advisable at the onset of the attack.

After all articular trouble has apparently passed away, the limb must for some time longer be kept at rest, and the patient under supervision. To give free play to the joint which has only just become convalescent, is to invite the invasion of chronic disease.

Acute suppuration sometimes follows in the course of the synovial inflammation, the neighbourhood of the joint becoming greatly swollen, and more red and cedematous, the intra-articular effusion being at times obscured by cellulitis. The least movement of the leg is attended with exquisite pain; sleep and appetite have deserted the patient, leaving him in a condition of great constitutional excitement, and even peril. In these critical cases two points have to be cleared up: Is there certainly abscess? and, if so, is the pus inside or outside the joint? The first question is answered by thrusting a fine aspirator needle into the depths of the swollen mass, when, if only slightly turbid fluid be withdrawn, the tension may thus be set at rest, and, under the influence of the treatment advised above, local and general quiet may be re-established. During this examination the child should be under the influence of an anæsthetic.

When pus is detected in the joint, temporising is not only futile but dangerous; yet the dread which we have inherited of opening a suppurating joint is not, unfortunately, altogether a thing of the past in the surgery of childhood.

Whether inside or outside the joint, an abscess

must be freely opened, and that *at once*, for if outside the joint, the pus may quickly make its way into the interior.

The use of the scalpel should be limited, the way being cleared by the director and dressing forceps; everything should be scrupulously clean—even the fingers of the nurse or dresser. The abscess cavity should then be completely emptied by gentle pressure, and its cavity thoroughly washed out with a solution of decolorised iodine, or of some other trustworthy antiseptic. Any bleeding vessel in the skin-wound should be secured. Then the limb must be fixed in absolute rest, the joint having been firmly surrounded with a thick packing of salicylic wool and carbolised tow; a drainage tube will be required for a day or two.

When carbolised irrigations are used heed must be given lest the child suffer from the effects of *carbolic acid poisoning*, the signs of which are drowsiness, depression, sickness, collapse, and a low temperature, the urine being olive-green or dusky.

The **prognosis** must be considered as affecting the loss of the joint, of the limb, of the life. The best result that can be generally expected is firm bony ankylosis, and with this object in view, the limb should be kept in absolute rest in the extended position for week after week. As the amount of the discharge diminishes, the drainage tube may be of smaller calibre, and at last a strand or two of horse-hair or silk may suffice to ensure freedom for discharge.

Occasional irrigation of the joint with an antiseptic fluid must be observed. If there should be a second abscess in the upper pouch of the synovial membrane, it must be freely opened, washed, and drained. Care must be taken against the occurrence of pressure sores along the back of the limb, the heel, and the pelvis. Iron and quinine, and two or three ounces

of wine, will be the chief medicines needed ; opium may be found of value.

Though ankylosis will be the best result that can be reasonably expected after the formation of intra-articular knee abscess, still, if the suppuration have not involved the destruction of the cartilages and ligaments, recovery may take place with a freely movable joint. I have had several such results ; three of the subjects of them were exhibited at a meeting of the Medical Society of London.* To secure such happy termination, it will be necessary to open the abscess as soon as it is diagnosed ; to let the openings be free ; to see that the washings are carried out with thoroughness. The general supervision of the case must be close and constant.

Supposing that the child survives the bursting of abscess, or treatment by incision, but that the joint continue to discharge such a large and increasing amount of pus that the child seems likely to sink under the constant drain ; and that the skin and, so far as can be determined, the other tissues about the joint appear unhealthy, and all hope of obtaining even ankylosis of the joint has been given up, what line of treatment shall be adopted ?—erosion, excision, or amputation ? This important matter will be considered farther on (page 474).

If the **abscess** be **extra-articular** the swelling and fulness will not be evenly distributed around the patella, as it would if the joint cavity were implicated, and the patella itself may be partially or completely obscured ; it would not be floating. Moreover, the joint may be moved without alarm, provided the examination be conducted so as not rudely to interfere with the sensory nerves of the inflamed area.

Abscess in the subcrural bursa is at times so suggestive of intra-articular disease, that it becomes

* *The Lancet*, Feb. 12th, 1881.

almost impossible to say with certainty whether or no the joint is implicated. I have met with several cases of this sort ; and, doubtless, if they had been allowed to run their course, they would in time have involved a wreckage of the joint. There is with this condition considerable local and constitutional disturbance ; and there is a good deal of swelling and œdema about the knee, but the joint is not, perhaps, much bent, and the enlargement appears to involve chiefly, or altogether, the upper pouch of the synovial membrane. If there be but a small quantity of pus the case may look like one of inflammation of the lower epiphysis of the femur, but the thickening is almost entirely antero-posterior, and only slightly from side to side. If the collection be more considerable, there will be a great inclination to consider the case as one of disease of the knee joint—chiefly of the upper part. But, then, the fluid, even when the child is under an anæsthetic, cannot be driven beneath the patella nor by the sides of its ligament, and the patella is not floated—though this condition does not always obtain even in well-marked articular suppuration.

The *treatment* consists in cleansing the part and making an incision into the swelling ; then, on introducing the finger, the limits of the bursal cyst are manifested. The cavity must be irrigated and drained, and the limb is to be fixed on a splint. Directly after this the enlargement about the knee begins to subside.

Hydrops articuli sometimes follows slight chronic synovitis. The joint should be aspirated, and compressed, and enclosed between lateral splints of gypsum or leather. The child needs rest ; tonics must be ordered. A grain or two of iodide of potassium may be given three times a day ; iron and cod-liver oil may be needed.

CHRONIC SYNOVITIS, PULPY DEGENERATION, OR
STRUMOUS DISEASE.

Pathology.—The morbid change generally begins in the synovial membrane, which is converted into an indolent and thickened pulpy mass. In places it is pinkish grey, but throughout it is œdematous and soft, and resembles unhealthy granulation tissue. It bulges evenly, and forms a mass of padding by the side of the patella and its ligament, and under the lower part of the quadriceps extensor of the thigh. Sometimes it gives the sensation of there being fluid in the joint, but no definite wave of fluctuation can be transmitted from side to side beneath the patella. Wandering corpuscles infiltrate its substance, whence they escape into the serous, cloudy fluid which represents the synovia, and excite degenerate changes in the adjoining ligaments and cartilage.

Thus, the ligaments slowly give way, the articular cartilage is softened and eventually disappears, and the bone becomes carious. Abscess may form in the substance of the swollen mass or in the interior of the joint, or even, though less frequently, outside it.

Destructive changes may extend to the skin, which by this time has become red and tender; and an ulceration which has quietly formed will allow of the escape of unhealthy pus, and also of an extension upwards of a fungating mass of granulation tissue, which is now the sole representative of the softer elements of the joint. One tissue of the joint is so quickly implicated after another, that clinically it is inexpedient to try to draw a distinction between synovitis and arthritis.

The **cause** of the disease is likely to have been wet or cold, or some such injury as a sprain or blow. It may run its course even in a comparatively healthy child, unless rest for the joint, and other conditions,

be secured. The more unhealthy the child the greater the probability of eventual destruction, whilst the joint of the typically "strumous" subject is, of course, most speedily disorganised. What the association may be between strumous synovitis and the presence of bacilli in the swollen tissue cannot at present be definitely stated; possibly it is but accidental. But it is a suggestive fact that members of the family of the child with chronic joint disease are liable to phthisis and other forms of tubercular disease.

Symptoms.—Attention may first be called to the joint on account of the child limping, and though he may have complained of nothing more than an occasional aching after exercise, or of the knee feeling "hot" at night, a careful examination may show the part swollen and the muscles already wasted. Sometimes, however, there is almost complete absence of pain from beginning to end of the disease, and thus the case is overlooked and treatment neglected.

If the child continue to limp about, the joint becomes more swollen and flexed; and the globular or ovoid mass of the knee looks still larger on account of the muscular wasting; but the bones are not enlarged.

There is no true fluctuation in the joint, the swelling being due to œdema of the synovial membrane. The skin is thin, pale, and shining, and marbled with turgid veins, the general appearance justifying the epithet of **white swelling**.

As the disease advances, the pain becomes increased, and the least movement or shake causes intense distress. The child is awake from sleep by sudden and painful startings. These startings may suggest the occurrence of ulceration of the cartilage, but they may occur previous to any definite lesion of that tissue.

The **deformity** of the knee is due not only to the thickening of the synovial membrane, but also to a characteristic displacement of the tibia upon the femoral condyles. The head of the tibia is drawn backwards (flexion), to relax to the utmost the lateral ligaments, which are placed well behind the axis of the joint. Later on, the muscles which steady the joint in this easy position undergo permanent shortening, and the head of the tibia is brought to the very back of the condyles.

As the ligaments soften and yield, and as for ease and comfort the limb is resting constantly upon its outer side, the head of the tibia, from the mere weight of the leg, drops to the outer side, whilst the weight of the everted foot determines at the same time an outward rotation of the leg. Thus the head of the tibia is carried backwards and outwards, and is rotated outwards. This deformity goes on increasing until the internal condyle of the femur projects beneath the skin like a morbid outgrowth. Internal rotation of the tibia, which is prevented in the sound joint by the locking of the crucial ligaments, is sometimes obtainable after long-standing inflammation. It implies destruction of the crucial ligaments and advanced articular disease.

Either with or without the occurrence of abscess, the joint may become ankylosed in this position, the limb being left useful though seriously deformed. The gait of such a patient may be greatly improved by a thick boot, but it is advisable not to supply this boot too soon, lest compensatory tilting of the pelvis be altogether prevented.

No attempt to forcibly straighten out the ankylosed knee should be undertaken ; nor, unless the deformity be extreme, should excision be advised. If there be enough movement to show that there is no synostosis, an attempt may be made to straighten the limb

gradually by Thomas's splint. To leave well done alone is an adage peculiarly applicable to slight deformity left after the clearing up of old-standing



Fig. 79.—Disease of Right Knee Joint. Patten raising sound side.



Fig. 80.—Thomas's splint for Knee or Ankle.

articular trouble. With care and patience, even extremely unpromising cases of deformity may be straightened out by the splint (Fig. 80). But straightening of the limb, even by the use of Thomas's splint, may take place vicariously, through the junction cartilage below the head of the tibia. And

even then, with the growth of the child, an extremely serviceable limb may be secured.

The **treatment** will consist in obtaining absolute rest; if the child be young or untrustworthy he should be secured in his cot, the thigh and leg being encased in a rigid splinting which will reach almost from buttock to ankle. This may be made of undressed leather softened and moulded on to the sides of the straightened limb, and secured by straps; or plaster of Paris may be used as in a Bavarian splint.

If a child be old enough he may be fitted with a Thomas's knee splint (Fig. 80) and allowed to walk about as depicted in Fig. 79. Though no child is too young for these splints, it is only the trustworthy child that can be allowed the use of crutches. If there be much displacement of the tibia, the use of Thomas's splint will be well nigh indispensable.

This apparatus is of infinite service in the treatment of all forms of knee-joint disease, either with or without suppuration, where permanent rest and correction of deformity are sought. It consists of an ovoid ring of $\frac{3}{8}$ -in. iron, well padded, and covered with leather. It is welded obliquely upon the upper ends of two parallel iron rods, which are long enough to reach several inches below the sole of the foot, where they are connected with an oval patten. A leather apron is stretched across the bars to support the back of the limb. The lower and more thickly-padded part of the upper ring fits against the perinæum, and is kept in its place by a brace passing over the shoulder of the sound side. The thigh is first fixed in the trough of the splint by a wide flannel roller, but the leg is not to be so firmly bandaged to the splint as the thigh has been, so that, as the limb yields to the pressure, the foot may descend. As so often happens when any other form of splint is being used, the limb cannot twist round

and escape the gently straightening pressure. During the treatment friction is arrested, and the child, if old enough, can walk about all the time that the cure is advancing, and without fear of hurting the knee.

The method of treatment by **weight and pulley** is not nearly so satisfactory as this either in bringing the knee straight or in completing convalescence; besides, whilst the cure is being wrought the boy has to be kept in bed.

With the intelligent use of Thomas's knee splint persistently carried out until all pain has disappeared, either from perfect recovery or ankylosis having occurred, excision will be less frequently required. The force thus applied is altogether different in its effect from energetic straightening under chloroform, the result of which is often to shift the tibia farther back upon the femoral condyles, as the posterior ligament and other resisting media are tightened up under the strain, or else partially to unglue the epiphyseal cartilage.

The value of Scott's dressing of camphorated mercurial ointment probably depends upon the combined effects of compression and rest. With the use of the iron splint, external applications will be rarely needed. Cod-liver oil or quinine and steel may be prescribed with advantage.

Prognosis.—Under prolonged treatment the joint may clear up completely; or the disease may end in ankylosis. But in every case there is a great risk of the joint being freed from restraint too early. So long as there is any excess of heat of the surface of the limb, or the child complains of pain at night, the splint must be worn, and even for a good while after that. It is inflammation, not rest of the joint, which produces permanent stiffness; and when a joint which has been allowed some short period of freedom, or of gentle exercise, on approval, is found

to be neither warmer, stiffer, nor more painful than it was when the restraint was left off, there can be little doubt that the disease is at an end. But if the surgeon be not satisfied on this head, he should, notwithstanding the disappointment which his edict may involve, insist on a return to perfect and uninterrupted rest. No "passive movements" should be tried.

It is always a good sign when, notwithstanding the wasting of the limb, an enlarged or globular joint begins to show once more its proper shape. This means not only that the fluid is being steadily absorbed, but also that the thickening of the synovial membrane is diminishing.

The question of **arthrectomy, excision, or amputation** is a grave one; and although the surgeon may have it constantly before him in the treatment of a case that is not answering to the remedies employed, he must always approach it with full deliberation. And when it is evident that the adoption of one or other of these heroic measures is necessary to save the child's life, he should be guarded in the manner in which he communicates the facts to the parents. He must lay the case before those whose duty it is to decide what, if any, new course should be taken. Though a parent might not hesitate to give consent to the removal of his own limb, he will sometimes decline to allow the adoption of a similar course with respect to his child.

The surgeon should be guarded in expressing his opinion, however strongly he may hold it, that unless he obtains the consent which he asks the child will surely die. It has happened to me, as, doubtless, to other surgeons, that in thus definitely demanding the sacrifice of the joint or the limb, the parents have removed the child from hospital, and watched his happy convalescence at home! Possibly the case was just

about to mend at the time of its being taken from hospital, or it may be that the change of air should have the credit of the improvement; but the awkward fact remained, that after the treatment urged by the surgeon in measured words had been declined, the joint began to mend.

It is but natural that the profession and the public take different views of the question. The profession may be right in urging operation in the strongest terms, for experience has shown that nine out of ten such cases, if left uninterfered with, would end fatally. The most judicious course, therefore, for the surgeon to adopt is to lay the facts clearly before the parents, explaining the risks and the alternatives, advising from opinions founded on broad principles; urging operation, but never commanding it. The surgical art cannot yet claim infallibility.

Appreciation.—If the child be rapidly going down hill, be losing appetite, growing restless, maintaining a high temperature in the evening, and a constant morning fall; if the joint-ends of the bones themselves have become thickened from disease, or the surrounding tissues grievously infiltrated with matter, or riddled with sinuses; if the urine be albuminous, the liver large and hard from amyloid degeneration; or if moist rales be heard over part of a lung, or the presence of disease in that tissue be rendered evident by occasional attacks of hæmoptysis; or if the incurrence of severe diarrhœa threaten a fatal issue, the propriety of amputation at the lower third of the thigh is unmistakable.

As to treatment by the application of sulphuric acid, which is introduced on strips of lint into the well-cleaned joint, by free lateral incisions, the essential part of it may consist in the free incisions which it necessitates, and the subsequent rest, rather than in the therapeutic influence of the acid.

A great deal may be done by ensuring a free escape for discharge. If this source of irritation be removed, and the parts kept at rest, what is there to hinder the supervention of ankylosis? Much of the value of exploration and of the so-called "partial operation" depends upon the ensurance of free escape for discharge.

Arthrectomy, or erosion of the joint, is a very suitable operation in disease of the knee; in my opinion, it is likely in time entirely to take the place of the classical operation of excision, over which it possesses this great advantage, that whilst it removes all diseased tissue from the articulation, it does not interfere with the healthy tissue, and thus the permanent shortening of the limb is considerably reduced. I have adopted the operation with success in certain advanced cases in which I would have hesitated to subject the child to the risk of excision, and in which amputation appeared to be the only alternative. But these are not, of course, the cases which the surgeon would choose for arthrectomy.

For the operation the limb is thoroughly "cleansed," and a horse-shoe incision is made into the joint, as described under the heading "Excision" (page 480). With Volkmann's spoons, and scissors, the whole of the diseased synovial membrane is then cleaned away, and every part of the articular surface of bone and cartilage is thoroughly dealt with. The semilunar fibro-cartilages are taken away, as are also all diseased parts of the capsule of the joint. Special care is paid to scraping out every ulcerated patch of cartilage and bone, cavities thus being cleaned out in the femur or tibia large enough to receive the top of the finger or thumb. The saw is not used. The posterior surface of the patella is thoroughly scraped, but that bone is not taken away unless it appear extensively and deeply implicated. After the crucial ligaments have been

dissected away and the lateral ligaments divided, the end of the femur is thrust out of the wound, and its posterior surface, and the front of Winslow's ligament, if implicated, are scraped over. Abscesses and cloacæ communicating with the joint are zealously cleaned out, and the granulation-tissue in the subcrureal pouch is also efficiently dealt with. From time to time during the operation the interior of the joint is washed out with a warm solution of mercuric chloride (1 in 4,000), and when, after the expenditure of a large amount of time and industry, there seems to be not a particle of diseased tissue left, a hole is bored by a pair of scissors through that part of the posterior ligament which intervenes between the popliteal artery and the biceps-tendon. Through this a drainage-tube is passed; another tube may be inserted in the front of the joint, the rest of the crescentic wound being closed by sutures.

The limb is then fixed straight on a back-splint with a foot-piece, a small sheet of waterproof jaconet being laid between the mercuric wool-pads, which surround the knee, and the padding of the splint. The heel must not be allowed to press upon the pad of the splint, as the limb may not be moved for some weeks. A bracketed splint is secured along the outside of the limb, reaching up to the arm-pit.

I have several times been astonished at the general improvement which the child has manifested after this operation: it is as if his system had been freed by the scraping away of certain elements whose presence had a most baneful influence upon him. Whether the head and front of the offending were the bacilli tuberculosis or not, I am unable to say. What I know is that after the operation the child may at once begin to get well, and sometimes without the temperature being raised a single degree throughout the convalescence.

It is quite possible, or even probable, that if the

extent of the disease did not necessitate the severe and general interference which I have described above as being necessary in an advanced case of disease, the child might ultimately recover with a limb neither shortened nor stiff; but it will be a misfortune for the future of the operation of arthrectomy if, in an endeavour to secure a movable joint, the surgeon be sparing in his dealings with the articulation. As the discharge ceases, the limb should be arranged in a Thomas's splint, but no attempt should be made to bend the knee; keeping it fixed will not diminish the chance of its future mobility, and any attempt of the surgeon to hurry on a return of movement will be likely to prove not only harmful, but disastrous.

Arthrectomy seems specially adapted for those chronic cases of knee disease in which a joint, swollen, shining, and deformed; stiff and painful; refuses to improve under a long and carefully-conducted course of rest and of general treatment. These cases are as common as they have hitherto been troublesome and disappointing; some of them have been mutilated by excision, others have been allowed to drift on until they were complicated with extensive suppuration and albuminoid disease, and until amputation held out the only chance of saving the life. The great feature of the operation is that it in no way interferes with the growing ends of the bones, and that, in consequence, no shortening is to be anticipated.

Mr. Wright, of Manchester, who reported the first cases of arthrectomy, has premised that the operation is applicable to cases of disease in which treatment by real rest has failed, but the disease is not so extensive, nor the general health so bad, that amputation is called for; when there is not such general disease of the bone that removal of the whole of the extremities of the bones forming the joint is demanded. Tubercular disease of the synovial and ligamentous tissues

with or without local lesions of bone and without extensive suppuration are the cases most suitable, but further experience is needed before more positive statements can be made.

After the operation the limb is to be kept absolutely stiff, and fixed in splints for many months, and if at the end of that time a certain range of movement be discovered, the joint may be left to shake itself free, no manipulations being resorted to. But in all probability the knee will be synostosed and straight.

In the case of pulpy or chronic suppurative disease of the knee joint the operation is specially adapted, provided that the disease is not too far advanced so that the bones are extensively implicated, and that the patient is the subject neither of general tuberculosis nor of albuminoid degeneration. In short, arthrectomy is the proper operation in most of those cases in which resection has hitherto been performed. Over resection it holds this great advantage, that it takes away from the articular surfaces only such tissues as are actually diseased.

It is hardly necessary to remark that arthrectomy is adapted for other joints than the knee; but its principles having thus been fully described, it must be unnecessary to recapitulate them when dealing with the subject of chronic disease of the hip, ankle, shoulder, elbow, and wrist. (*See Trans. Soc. Med. Chir.*, 1889.)

Excision.—If the disease have been running a long, intractable course, and have made, after many weeks or months of careful supervision, no real improvement; if the bones do not appear too extensively diseased, or their shafts expanded; and if the patient be the subject neither of marked struma nor exhaustion; if the lungs be sound, and the urine contain no albumen, excision may be fairly undertaken. Though, in my opinion, it is by no means so suitable an operation as arthrectomy, except

in those cases in which the bones are somewhat extensively implicated.

The **operation** should not be precipitate; every preparation should have been made in advance. The bowels should be well open in the morning, so that there may be no disturbance after the operation. The splints should have been carefully planned, padded, and covered, and the limb well washed with soap and water and an antiseptic fluid. The instruments should be at hand, and the assistants informed of their respective duties. Chloroform having been administered, a semilunar flap is made by an incision which starts from the lateral swelling (tuberosity) of one femoral condyle down to the tibial tubercle, and up again to the tuberosity of the other condyle. The horns of this incision should reach well back, so as to be available for subsequent drainage; the knife should pass right down to the bones. Bleeding vessels will then be secured. It is better not to operate with the assistance of Esmarch's band, as the bleeding is always troublesome after the compression has been removed. There should be no hurry over the operation; each bleeding point should be attended to before the next step is taken. The crescentic flap of skin and subcutaneous tissue is boldly dissected up from the front of the patella, and the joint opened by passing the knife across the top of that bone, and down each side of it and its ligament—the ligament itself being severed at its lower attachment. The patella can be of no use to the ankylosed knee, and, if left, there is a chance of its cartilage becoming the seat of further degenerative changes.

The knee is then flexed, and the lateral and crucial ligaments are cut. The former are best attacked just below the level of the femoral tuberosities. The articular surface of the femur is cut off by a broad, oblong saw, which is directed straight

down to the head of the tibia. If the joint be partially ankylosed, force may be required in detaching the patella and flexing the joint, but when the joint is flexed the section of the femur can be effected, as described above, without risk of wounding the popliteal artery.

The layer of cartilage between the shaft and epiphysis of the femur should not be damaged; on the integrity of this layer the subsequent growth of the thigh bone depends. So also with the upper epiphysis of the tibia; the epiphysis which is last to join is that most concerned in the lengthening of the bone.

A great advantage of the wide-bladed saw is that it may be used as a lever to complete the separation of the condylar mass, instead of its being sawn through. Butcher's bow-saw should be used only when the bone is to be cut from behind forwards; that is, indeed, its only advantage; it should not be used as an oblong saw. If the oblong saw have not a shifting back, its blade must be deep enough to complete the section without the back checking its career. The chain-saw should not be used; its linked recesses are apt to contain septic matter. As the femur is being sawn the thigh and leg must be firmly held by the assistant; next, the articular surface of the head of the tibia is to be sliced off. The surgeon then looks if he have two evenly cut and healthy surfaces which will come flat together without much strain to the tissues behind the knee. If the strain prove excessive, another thin slice of bone may be removed, or some of the hamstring tendons divided. If after the section the condition of the bone appear untrustworthy, the gouge may perhaps be used with advantage; but broad and healthy surfaces of the bones must be left in apposition, or a good result will not be obtained.

When about to excise, the surgeon must have all matters arranged so that he may amputate if, as he

proceeds, he consider the adoption of that course expedient. Any small osteal ulcers or abscesses met with in the course of the excision must be scraped, and all granulation tissue and degenerate synovial membrane removed by using Volkmann's spoons.

If oozing of blood be troublesome, and delay the final steps of the procedure, the cut surfaces may be swabbed with a strong astringent and antiseptic solution—*e.g.* of chloride of zinc, of the strength of ten grains to the ounce.

When all bleeding has ceased, but not until then, the sawn surfaces are to be permanently adjusted, and the limb steadily held whilst being bandaged on a back splint with a foot piece. This splint should reach up to the fold of the buttock, its padding being protected by waterproof jaconet at the back of the knee. As it is not to be taken off for several weeks, it may be secured with firm strapping or plaster of Paris rollers. Care must be taken that the heel does not press upon the pad. A common and unfortunate contingency is the backward displacement of the tibial surface.

The extremities of the wound may be left gaping, a catgut or tubular drainage being inserted if considered advisable. The knee is then packed around with salicylic or sublimate wool, and a splint, long enough to reach from the axilla to the foot, secured along the outer side of the limb and trunk. This, as advised by Gant, has an excellent steadying effect upon the knee. This first dressing is applied before the patient is taken from the table. If the outside splint be arranged with a bracket, less disturbance of the apparatus will be needed at the subsequent dressings. The dressing requires changing next day, or the next day but one, the child being under an anæsthetic. The outside splint will be removed, but the back splint should not be disturbed.

Synostosis needs many months, during which time the child may be suffering from the exhausting effects of discharge ; but recovery may yet take place if the surroundings be favourable. In some cases the shock of the operation itself proves rapidly fatal ; in others acute or chronic osteo-myelitis, a complete failure at firm union, secondary abscesses, or irritative fever, necessitate amputation or cause death. In some cases a partial success is obtained, and a subsequent laying open of small abscesses, or a limited or complete resection may at last accomplish perfect consolidation.

The intercurrent of albuminuria, tubercular deposit in the lung, or hæmoptysis, may call for immediate sacrifice of the limb. Sometimes an excision goes on well for weeks or months, and then a degenerative process supervenes which may entail amputation.

If, though the case do fairly well after operation, a chronic discharge continue from a sinus which is evidently leading down to ulcerated bone, excellent effect may be derived from sending the child into the country or to the sea-side. But if this fail to establish health, the wound may be enlarged and the bone explored and scraped. If this be unsuccessful, it becomes a question as to whether a secondary excision be performed or amputation resorted to. The former line of treatment should be undertaken only if the general health be satisfactory, and, judging from the result gained by the previous operation, if still further improvement seemed likely to be obtainable. If the child were losing ground, amputation would be demanded.

The removal of a wedge-shaped piece of bone from the joint end of the femur or tibia—perhaps of both—is an excellent operation in certain cases of angular deformity of the knee in which solid

bony union has followed the destructive arthritis. The child should be in good health, and the limb should be fairly developed; yet in cases in which only the former of these conditions exists a good result, at least as regards deformity, may be secured. There is a great risk, however, that the epiphysial cartilage will be interfered with; and in all cases imperfect development of the limb must be expected.

Though **amputation of the thigh** for knee-joint disease should be resorted to only in extreme circumstances, it is a highly satisfactory measure as regards the rapidity of convalescence. A child in the last stage of exhaustion from knee-joint disease may a few days after amputation be sitting up in bed, playing with toys and enjoying his meals.

Amputation of the thigh is performed under chloroform, no matter how weak and emaciated the child may be. The thigh should be thoroughly cleansed, and washed over with a warm solution of carbolic acid, or mercuric chloride.

In many of these poor children the limbs are covered with long silken hairs; these had better be shaved off, as they adhere to the dressings. This hairiness is generally associated with constitutional weakness. The limb may be simply raised to empty it of blood, and circulation controlled by the fingers of a colleague, or by a flat elastic band fastened round the limb just below the groin; but there must be no severe constriction of the wasted limb. The first flap is cut in the front of the thigh by a large scalpel, but not by transfixion; it should be longer than the posterior, so as to fall eventually over the sawn bone. It should consist of skin and subcutaneous tissue; nothing is gained by its containing any muscular tissue. The skin at the lower end of the flap should be healthy, but the presence of an old sinus or ulceration matters little,

provided that the weak granulation tissue be subsequently scraped. The posterior flap should also be dissected. The flaps being held well out of the way, a circular sweep is made with the knife down to the bone.

The chief vessels are to be looked for, and tied with fine catgut, before the compression is relaxed; every bleeding point is to be secured; the less of sponging the better. When bleeding has ceased, a drainage tube is to be laid across the depths of the wound, and the edges secured by a continuous suture of fine wire deeply inserted. A few syringefuls of sublimate solution may be passed between the flaps. The dressings may be of wood-wool or dry lint, the limb being secured on a short splint. Opium may be required.

Next day, or next day but one, the dressings should be removed under chloroform, and the drainage tube replaced by a smaller one, the sutures being left, and dry dressings being again applied.

The second dressing will be required in about a week, or earlier if there be oozing. On the occasion of this dressing the sutures may be removed, the wound being all but healed. Soon after the operation the child should be placed in the sunshine or open air. When the limb has become perfectly sound, and free from pain, the child should, if old and strong enough, be trusted on crutches. An artificial limb should not be supplied for a year or two, at the earliest.

CHAPTER XXXII.

DISEASE OF THE SHOULDER AND ELBOW JOINTS, ETC.

THE head of the humerus is held against the shallow glenoid cavity in the loose embrace of the capsular ligament. Thus, practically, every movement of the arm is unlimited, and that fruitful source of joint disease, sprain, is comparatively harmless. In addition, the scapula plays freely over the chest, so that violence is little likely to affect the joint.

A not uncommon cause of **traumatic synovitis** or arthritis is pulling or swinging a child by the arm. Pain is complained of at the shoulder, but as the joint is thickly covered by the deltoid, and no redness of the skin supervenes, the mother, seeing nothing amiss, gives the matter no further heed. The boy meanwhile uses the arm as little as possible, putting on his dress cautiously; with this rest the joint may recover, provided that the child be strong and healthy. If the surgeon were called in, as he should have been, he would probably have found the skin over the shoulder slightly warmer than on the other side, and the immediate region of the joint swollen, elastic, and tender. If he abducted the arm whilst the fingers were placed over the inferior angle of the scapula, he would have found that the scapula moved with the arm. This is evidence of a stiffness of the joint, probably the result of intra-articular effusion. The muscles of the arm and shoulder-blade quickly waste when the joint is inflamed, and leave the bony eminences unduly prominent.

Treatment.—Complete rest must be enforced, and while the joint is painful, the child should not be allowed to disturb it by passing his arm through the

sleeve of his frock or shirt. In this way the arm is effectively rested, for he must wear it beneath his clothes. It had better be raised in a sling, and fixed to the side, and he should not have free use of it until all swelling and pain have disappeared. (For the means of confining the arm refer to page 403.)

Suppuration in the joint may supervene if the child be unhealthy, or if the violence which set up the synovitis were extreme.

Case.—A nurse girl swung an infant violently by the hand; immediately afterwards the left shoulder joint became painful, swollen, and tender. Any attempt to abduct the arm caused the shoulder blade to move with it. The arm was fixed to the side. Anodyne mixture, and poultice were prescribed. Three days later the infant was sleepless, and without appetite. There was evident tension in the joint, and the skin over the shoulder was red, possibly only from the poultice. Under anæsthesia a fine tenotomy knife was passed through the deltoid and into the joint, and, pus escaping, the track was enlarged with the dressing forceps, a large abscess being evacuated. The cavity being washed out with iodine water, a small drain was inserted, the arm fixed to the chest, and the shoulder packed around with antiseptic dressings. Relief was immediate and permanent. When, two years later, the child was examined, the range of movements of the joint was found perfect; indeed, there was no evidence of the old articular disease, except a small white scar, which indicated the site of the operation wound.

Suppuration in the shoulder joint demands early relief of tension. Unless the matter be afforded free escape, the joint may be completely destroyed. Such local and constitutional disturbance as that in the case just recorded must needs be associated with abscess. If in any case there be doubt as to the presence of pus, a grooved needle may be introduced.

Even with the early adoption of therapeutic measures the inflammation may advance, suppuration becoming abundant and continued. With perfect rest and drainage such a joint may still recover with little, if any, impairment. Or the inflammation may give place to a perfect synostosis. This last is not, however, a very serious drawback; its presence should be considered a happy termination of a grave condition. The scapula plays so freely upon the chest that the deficiency of the joint movements can be thus vicariously and ably performed. It is doubtful if a better practical result could be obtained by excision than is sometimes seen in cases where ankylosis has supervened in childhood; and this should make one pause before subjecting the patient to a serious operative procedure. If the head of the bone be necrosed, there may be no option but to excise, performing, at the same time, a modified arthrectomy (page 476).

For **epiphysitis**, see page 396.

Excision is rarely required; patient and prolonged supervision of the child, and perfect rest of the limb, may restore the joint, even after long continued suppuration, and will generally suffice to establish a useful, though ankylosed, limb.

THE ELBOW JOINT.

Entering into the formation of the elbow joint are the humerus, the ulna, and the radius, their articular surfaces being enclosed in a capsular ligament, and lubricated by a single synovial membrane, one reflection of which descends into the superior radio-ulnar articulation, and lines the orbicular ligament.

Synovitis. — When inflammation attacks this membrane, one of the first objective signs will be the partial effacement of the dimple in the skin, which should be found below the external condyle of the humerus when the elbow is extended. At the depths of

this dimple are the head of the radius, and the most subcutaneous part of the elbow joint. When synovitis is suspected, a careful comparison of the two elbows should be instituted, and first as regards this dimple. Bulging may also be found at the front and back of the internal condyle ; and, later on, as the joint becomes more distended, a fulness may be detected on each side of and above the olecranon process, and even at the front of the elbow against the pronator radii teres.

Other signs of the inflammation will be the increased warmth of the surrounding skin ; but in estimating this, due allowance must be made, perhaps, for the fact of this elbow having been carefully wrapped up, or the other arm being left exposed through a short-sleeved frock. Redness of the skin is not an early sign of inflammation within the joint unless the inflammation be excessive. Some stiffness there is certain to be ; the child will not allow the fore-arm to be completely extended on the arm, because in this position the strongest part of the capsule is put on the stretch, and the intra-articular pressure thereby increased. As the synovitis increases, the whole neighbourhood of the joint becomes enlarged, the fore-arm partially flexed, and more than half way pronated ; the skin will be flushed and hot ; there will also be complaints of pain and tenderness, and of disturbed nights.

The **cause of the synovitis** may be, as in the case of the knee, wet, cold, or injury ; delicate children will be the more likely to suffer from the effects of such exposure than the strong. The fashion of making little children wear low frocks and short sleeves, regardless of weather, is prejudicial. Synovitis is started by a sprain, a severe pull at the wrist, or by a fall upon the hand or elbow.

Treatment.—If the inflammation be slight, the limb should be bandaged from the hand upwards, and

the elbow compressed in plaster of Paris splints, applied over a layer of cotton-wool. Or the elbow may be firmly bandaged and fixed to a light, flexible iron splint; or a plastic splint may be moulded on as shown in Fig. 67; the hand should be worn in a sling. From the beginning of the treatment the elbow must be fixed at a right angle, lest disease end, perchance, in ankylosis. The case of slight synovial effusion must be treated with precision from the earliest moment, otherwise chronic inflammation or destructive arthritis may supervene.

Absolute rest with firm compression are found excellent treatment. But if the inflammation be very acute a couple of leeches may be applied. If lotions, liniments, or poultices have been just previously employed the skin must be thoroughly washed with soap and water, and sponged with milk, or the leeches may refuse to bite.

Abscess in the joint may follow if synovitis have been intense, if the patient be of feeble constitution, or the surroundings unsatisfactory. The oncoming of suppuration may be marked by a convulsion, increased feverishness, and restlessness. The skin may become thin and livid in the neighbourhood of one of the condyles, or along the outer border of the pronator radii teres, and fluctuation may be evident.

If needed to confirm the diagnosis, chloroform may be administered, and a grooved needle introduced; and, pus escaping, the abscess may be freely opened. The joint should then be gently squeezed between the fingers so as to empty it completely, and the cavity washed out with warm sublimate solution or iodine water. A small drain is to be introduced and the part surrounded with iodoform wool, the splint being reapplied.

Prognosis.—Cases of suppurative synovitis of the elbow may entirely recover, disturbance subsiding

on the relief of tension ; no more pus being formed, and the cartilages remaining unimplicated. But if ulceration have already attacked the cartilages, and an inflammatory softening have invaded the ligaments, **suppurative arthritis** supervenes.

Pus continues to escape from the opening already made, and a second, or even a third, aperture may be needed. Secondary abscesses form above or below the joint, amongst the muscles, and even beneath the periosteum ; the bones become carious and softened, and small sequestra may escape. The limb becomes peculiarly thin ; but though the elbow is greatly swollen, there is but slight, if any, expansion of bones, the thickening being in the softer tissues of, and external to, the joint. From the intensity of the inflammation the epiphyses may be loosened or cast adrift.

The **treatment of suppurative arthritis** of the elbow, unless of a pyæmic nature, is as a rule satisfactory. Thorough evacuation and drainage and rest must be provided for, the general health must be improved by the administration of quinine, iron, and cod-liver oil, and by judicious dieting. The cavity may be irrigated every day or two with warm antiseptic lotions. If in spite of judicious treatment suppuration increase, and the child's strength diminish, a partial or complete excision of the joint, with arthrectomy may be performed. Partial excision, when the disease is limited to a small area of bone, may be followed by an excellent result, both as regards the shape and the movements of the joint.

Excision gives marvellously good results in childhood. Though the limb above and below the joint be composed of apparently but skin and bone, whilst the region of the elbow is greatly swollen and riddled with sinuses, excision should be tried even though amputation be eventually demanded.

If the child be the subject of advanced lung disease, and possibly of hæmoptysis, if the urine be loaded with albumen, or the health exhausted, amputation would be appropriate.

The operation of excision.—Before the anæsthetic is administered the arm is to be thoroughly washed over with warm soap and water, and again with a weak antiseptic lotion just before the knife is used. The arm is drawn through a hole cut in a large piece of mackintosh sheeting, and the sheeting spread as a protection for the clothes. There should be no unnecessary exposure of the body to cold.

With a short-bladed scalpel a long median incision is made right down to the bones. It passes over the salient angle of the well-bent elbow, down to the humerus, the olecranon process, and the upper end of the posterior border of the ulna. The thinner the arm, and the less swollen the elbow, the shorter may be this incision; perhaps three inches may suffice for its length. Any cloacæ in or near the course of the incision should be made use of, but the knife should be kept well to the middle line. Nothing is gained by a deviation to the side of the olecranon process.

Esmarch's band should not be applied, on account of the troublesome oozing which takes place on its removal; all bleeding vessels should be secured as the operation progresses, and for this purpose the pressure forceps are of great value.

A strong, blunt raspatory is used for separating the periosteum from the bone, and with it much of the muscular and ligamentous fibres; where necessary, fibrous connections may be touched with the knife. The less that the knife is used, and the more that the bones are cleared with the raspatory, the less is the bleeding.

The attachment of the triceps to the olecranon process will require the use of the knife, but the

fibrous expansion from it to the deep fascia at the back of the fore-arm must be jealously guarded ; much of the future power of extension will depend upon its integrity. Bands of fibrous tissue should not be needlessly divided, lest they contain important nerves or blood-vessels, or lest their severance should detract from the future strength of the false joint. The ulnar nerve should not be seen during the operation ; it should be carefully raised in its bed of loose connective tissue between the internal condyle and the olecranon, and kept out of the way by a retractor, or slipped by the gentle leverage of the raspatory over the internal condyle.

Then, by forcibly bending the elbow, the end of the humerus may be made to project, and after a few touches with the knife or raspatory about the lateral and anterior aspects, the articular end may be cut off with sharp bone forceps. Only so much of the humerus as is condemned for removal should be bared of periosteum, lest exfoliation occur and convalescence be retarded. The articular ends of ulna and radius are then removed, and the interior of the capsule, the sinuses leading to it, and the abscesses associated with it, are thoroughly treated on the lines laid down under the heading "arthrectomy" (page 476). In fact, the operation is a combination of excision and arthrectomy, but there is this great difference between the operation on the knee and the elbow :—in the former case as little tissue is removed as possible, because ankylosis is expected to supervene ; whereas, in the case of the elbow, a false joint is desired. It is advisable to remove the head of the radius, lest, lying against the end of the humerus, it eventually become ankylosed to it, and the usefulness of the limb be thereby diminished.

The cavity should be washed, and deliberate search made for bleeding points. It is then loosely packed

with iodoform lint, the ends of the wound approximated with wire sutures, the dressings applied, and the fore-arm and arm enclosed in a soft bandage, with compression around the elbow. The solution of corrosive sublimate (1 in 4000) and dressings of wood-wool may be used. The arm should be laid upon a pillow.

When excision is performed for disease, the muscles are so wasted and feeble, and the limb so accustomed to lie quiet, that a splint is not needed; it would be different if the excision were performed for a recent injury. The sooner that the arm is moved about the better, but movements need not be resorted to whilst they cause distress. Free movement is desired for the elbow after excision, and not ankylosis, as in the knee.

The dressing next day had better be carried out under chloroform; when the stuffing is washed out by an irrigator, a drainage tube introduced, and the parts thoroughly cleansed.

No more lint need be inserted into the cavity, but the walls should be evenly compressed. The second dressing need not be disturbed for many days if all go on well; and the child may soon get about with the arm in a sling. Electricity is not of importance in the after-treatment; strength will return to the muscles in due course.

Appreciation. — Excision of the elbow for chronic disease is a satisfactory operation. In one case where I obtained a most perfect result, the neighbourhood of the joint was so enlarged, infiltrated, and undermined, that it looked as if amputation were the only measure which could afford permanent relief. For some weeks after the operation it gave little promise. But with the aid of quinine and iron, and a liberal diet, and, which was of the utmost importance, a visit to Rhyl, absolute convalescence was obtained. Every chance should be given to the arm

after excision, amputation being resorted to only when no hope of saving the limb remains. Indeed, if after excision suppuration persist, though, perhaps, in diminished amount, and if the swelling about the elbow do not materially subside, and if, in brief, the local and general improvement be disappointing, still the arm must not be thereon condemned for amputation; it is very rarely necessary to remove a limb for chronic disease of the elbow. The wound must be opened up under chloroform, and thoroughly scraped out, and washed with a solution of chloride of zinc (grs. 10 to 3i). And as soon as possible after this, the child, wearing the arm in a sling, and possibly for a little while on a splint, should be got into the fresh air—to the sea-side if practicable.

As the muscles gain strength and activity, and as the new fibrous bands connecting the ends of the bone undergo shortening and consolidation, the flail-like appearance passes off, and a useful joint obtains.

Synovitis of the wrist joint may follow a sprain or other injury. The wrist is hot and swollen, and every movement causes pain. The bulging of the synovial membrane can be made out all around the articulation, the position of the bony landmarks and the course of the tendons being obscured. This universal enlargement affords ample evidence of the joint itself being diseased.

Treatment.—A couple of leeches may be applied; the fore-arm, wrist, hand, and fingers enclosed in moulded splints, and the swollen part submitted to even compression. The splints should be applied at the front and back of the limb and should extend from just below the elbow to the tips of the fingers. My experience is that, as a rule, an inflamed joint does not obtain that thorough and efficient rest which is so necessary. For instance, in the case of an inflamed wrist-joint, the fingers are not always enclosed

in the splint, and the result is that the boy uses them for so many, and for such varied purposes, that rest is but imperfectly secured for the wrist. There need be no fear that such confinement will ultimately render them stiff.

If the disease linger, as it is apt to do in an unhealthy subject, suppuration may supervene, but the presence of abscess need not imply a permanent stiffness.

Secondarily the other carpal bones may be implicated, and abscess having been opened about the back or sides of the wrist, the probe may touch bare and carious bone. Probably the disease begins more often in the synovial membrane than in the bones. With prolonged treatment the disease may come to a tardy conclusion with no worse result than a stiffened wrist.

In these cases of chronic bone disease of and about the carpus, no gouging or other piecemeal treatment should hastily be adopted. With perfect rest of the part between moulded splints for a few or for many months a satisfactory result may be obtained.

If one begin to gouge away soft or carious bone there may be no end to that proceeding, and the very interference may increase the disease. Nevertheless, scraping may be resorted to as a tentative measure and with the hope of warding off amputation. Excision of the wrist is very rarely required. Nor is amputation often necessary for chronic disease of the bones or joints of the hand in children. In the surgery of the upper extremity conservative principles may be adopted with unusually good promise of success, but to secure it, time, and attention to matters of detail and general hygiene are needed.

Ganglion.—The cysts are small and uncomplicated. They are usually extremely hard, so as to offer the suggestion of their being solid outgrowths of the bone. They are generally more or less rounded

often flat, and are generally at the back of the wrist.

By firm pressure they may sometimes be burst, but, as a rule, they are best dealt with by the introduction of a stiff grooved needle. After their evacuation in this manner, they should be firmly compressed by the thumb each day, so as to prevent their re-filling.

Club hand, like club foot, is usually a congenital deformity, in which tendons, bones, and other tissues may be concerned. There are many varieties of it, the hand and fingers being inclined either backwards, forwards, or laterally; sometimes the position taken is a complication of two varieties. The bones of the fore-arm may be greatly at fault, and often the condition is associated with other and more important bodily deformities. Nothing is certainly known as regards its causation.

If the deformity be slight, it may be corrected by manipulations, frictions, and careful splintings; if more serious, subcutaneous division of fascial bands, tendons, or even of bone, may be required. But if the unsightliness be extreme, and the member useless, the propriety of amputation might require consideration.

In a case of **acquired club hand** lately under treatment, the hand was strongly adducted, the deformity being due to an injury to the lower epiphysis of the ulna, some years previously, by a chaff-cutting machine. This injury had arrested the growth of the ulna. The normal growth of the radius being unchecked, whilst the ulna remained undeveloped, the radius was strongly curved inwards. The hand was extremely useful, and on consultation it was decided that operation could offer but little improvement. (See page 410; also the *Lancet*, March 31st, 1888.)

Webbed fingers.—This deformity results from the imperfect notching of the distal extremity of the

lappet or bud which, in the early weeks of foetal life, represents the arm. The defect may be hereditary.

Several digits may be thus fused along their lateral borders, and the condition may be symmetrical on the two sides of the body. The uniting medium is composed of skin and subcutaneous tissue, with ordinary vascular and nervous supplies. Often the deformity is associated with an imperfect development in other parts of the body, and not infrequently with defective cerebro-spinal evolution.

Treatment should be undertaken in early childhood, but only when the web is unassociated with serious physical or intellectual deficiency.

Simply to divide the band in its entire length does not suffice, for, careful as the surgeon may be in the subsequent dressing, and widely as the fingers may be kept apart during the progress of granulation, reunion is sure to occur through a greater or less extent of the adjoining raw surfaces.

An ingenious plan of operating has been described by Mr. A. T. Norton,* and it promises a good result: A triangular flap of skin and subcutaneous tissue, of about half the size of one's finger nail, is dissected up at the front and back of the proper situation of the cleft, the base of the flaps being at the level of the heads of the metacarpal bones. This being done, the cleft is divided, and the raw surfaces of the flaps adjusted to each other by fine sutures; primary union taking place between these flaps, adhesion of the contiguous borders of the fingers can be effectually prevented. The dressings should be of an antiseptic nature, and for a few days the hand should be fixed on a splint and worn in a sling.

I have had personal experience of most of the ordinary methods of treatment of webbed fingers, and have

* *Brit. Med. Journ.*, p. 390; 1881.

no hesitation in saying that Norton's operation is far superior to any one of them, provided that the crescentic flaps are cut long enough to meet easily across the cleft, yet not so thin as to run the risk of sloughing. If the flaps unite by first intention—which they ought to do—success is ensured, and, after the first dressing the case progresses without trouble or anxiety. It is hardly necessary to say that the hand, the instruments, and the operator's fingers should, as demanded by the principles of modern surgery, be not only "cleansed," but absolutely clean.

CHAPTER XXXIII.

DISEASE OF THE ANKLE JOINT.

COMPARED with the hip and knee, the ankle joint is rarely the seat of disease. It is quite as much exposed to the influences of wet and cold as the knee joint, but its mechanism probably renders it less liable to the effects of violence. The commonest cause of disease is perhaps a severe sprain, such an injury as later on in life might expend its violence in rupture of the internal lateral ligament and fracture of the fibula. But on account of the elasticity of the child's bones, Pott's fracture is of infrequent occurrence.

Sprains.—If a child be running along, and his foot slips from an uneven surface, so that the weight which should be transmitted straight through the horizontal surface of his astragalus falls with unusual violence upon a lateral ligament of the ankle, a violent stretching results. In this stretching the

synovial membrane also participates, and a considerable amount, if not of blood, at least of altered synovia, is quickly poured into the interior of the joint. This effusion of synovia is not a product of inflammation, for it is found immediately after the injury, appearing even before the ecchymosis. Probably through the influence of the vaso-motor nerves, it is but an exaggeration of the ordinary physiological secretion of the membrane, though in a deteriorated form.

The **treatment** of a sprained ankle should be energetic and complete, lest, on the apparent subsidence of all active symptoms, chronic inflammation or persistent weakness remain. The child should at once be put to bed, and kept there for as long as necessary. To let him lie upon the sofa is not satisfactory, unless he be at the same time under constant supervision; he must on no account put his foot to the ground. The foot and ankle should be compressed by a soft and well-applied roller, the turns which encircle the damaged joint being drawn firmly, but not uncomfortably tight. A flexible and well-padded iron splint should be bent and fixed along the front of the leg and dorsum of the foot, and the limb should be raised on a pillow.

Relief will be certain and acceptable; the pressure and rest not only preventing the effusion of more fluid, but hurrying on the absorption of that already poured out. Possibly in a few hours the bandage will be found to require readjustment. Fomentation, lotions, and water-dressings are not so efficacious in the treatment of the sprained joint as is compression; and there is, perhaps, no better way of applying it than with the lateral splints of house-flannel and gypsum. The foot must be fixed at a right angle, or else when the child begins to walk again he will be unable to get down his heel, and the

joint will be strained, because the weight is transmitted unevenly through it.

When the effusion has disappeared, and the movements of the joint have become painless, the child may be allowed to use the foot; but even then, and for some time after, the part should be enclosed in a gypsum bandage or leather splints.

The more delicate the child the more need for all this care and precaution; but even for the most robust these measures should be duly regarded. How constantly does one find the answer to the question, "How do you account for it?" is, "He sprained his joint some time ago, but we did not take much notice of it."

If the child be tractable, and take an intelligent interest in his own case, he may go about with crutches, the sound foot being raised sufficiently by a patten or thick sole, so that in progression the diseased ankle receives no pressure or friction (Fig. 78).

Synovitis having supervened, the skin becomes hot and flushed, the joint is slightly extended, and incapable of painless movement. The capsule is full and bulging, and as the child walks he paddles himself along with the tip of his toe. Pain may increase to such an extent that the child is in great distress.

Differential diagnosis is required to determine if the disease be in the joint itself or in some synovial bursa, or other extra-articular structure, the joint itself being free. In each case there would be pain, ineptitude to motion, and swelling; but when the articulation is implicated, the swelling is characteristic. The synovial membrane bulges out in every direction, though the fulness will be chiefly noticeable amongst the tendons at the front of the joint, around the malleoli, and at the back. This posterior bulging may be generally found on each side of the tendon of Achilles, so that the tendon, instead of standing as a

prominent cord down to the heel, lies in the depths of a soft mass, which swells up on each side of it. Extra-articular abscess could not give rise to such universal fulness. Other morbid conditions, from which the ankle disease has to be diagnosed, are inflammation of the astragalo-scaphoid joint, and caries of the astragalus, os calcis, or scaphoid bone. In the first case, the universal swelling about the tibio-tarsal junction would be absent, and the tendons just above the front of the ankle joint would not be obscured by effusion, and probably the movements of that joint would be but little, if at all, interfered with.

With the astragalo-scaphoid disease the chief part of the redness and swelling will be over the front of the head of the astragalus, rather than at the line of the larger joint. If the disease be confined to the os calcis, the skin about the heel will be red, whilst the movements of the ankle joint will be found free. It is occasionally difficult to say exactly where the primary disease is located, and this fact makes one cautious in the proposal of interference. When an inflammation has been lurking long about the astragalus, or one of the lower synovia membranes connected with it, the morbid process may eventually spread to and involve the ankle joint. In hardly any case will it be necessary to use a probe in making a diagnosis. All the information that this instrument can afford the eye should be able to appreciate.

It is far less important, however, to be able to say exactly where the disease is situated than it is to be thorough in dealing with it. If I may be allowed to write it, there is often too much supineness in dealing with cases of apparently slight articular disease. A week's complete rest for a limb is really no great infliction for a child, whilst it may secure him from a lengthened period of articular disease. Parents are, as a rule, very averse from having a child kept from play

or school because of some trivial hurt; but when the matter is put clearly before them they usually accept the situation. But first of all they have to be disabused of that widespread superstition that a child materially suffers from being kept in bed. The risk is invariably from the opposite direction.

The **treatment** of acute synovitis of the ankle will consist in complete rest for the limb, the application of leeches, the adjustment of rectangular splints, and as much even compression as the angry tissues will bear. The leg and foot should be swung or raised upon a pillow. A little castor oil may be required, and an occasional dose of opium.

If **abscess of the ankle joint** follow the inflammatory trouble, the constitutional disturbance will increase, the diseased joint becoming more hot and swelled, and intolerant of the least disturbance. An incision should be made into the most prominent part of the swelling; this will probably be out of the way of either of the tibial arteries. The joint should be washed out with an antiseptic fluid, packed around with absorbent dressings, and permanently steadied by rectangular splints of leather, or gypsum, or wood.

Before fixing the foot at a right angle, it is often expedient to divide the tendon of Achilles, especially in those cases in which the disease is of long duration, and in which the toes are pointing downwards, as so often happens. After the tenotomy the position of the foot can be rectified with far less strain and disturbance at the joint.

The inflammation may be *chronic* from the beginning, the joint becoming enlarged on account of the swollen synovial membrane. The skin is marbled, and the muscles of the leg and thigh wasted. The disease may run its destructive course without the formation of abscess, even though the ligaments have

disappeared and the cartilages have undergone extensive ulceration.

Much time will elapse before the joint is fit for work ; it may be a question of months, or possibly even of years. But neither surgeon nor parent must be discouraged ; care must be taken that the foot is never put to the ground, and that the child does not stand up in bed.

Scott's dressing is a favourite application for chronic ankle arthritis ; its beneficial influence is probably exerted through the pressure and rest which its employment ensures. Infiltrated synovial membrane is hardly likely to be specifically influenced by the application of blue ointment to the neighbouring skin, even with the additional help of the camphor.

A gypsum casing, or leather splints, moulded from the roots of the toes well up the leg, may be adjusted, apertures being arranged to allow of the escape of discharge. With this protection the child may be carried about the house or taken into the open air. If he can be trusted with crutches, his leg may be fixed as for knee disease (Fig. 79), and he may then daily attend school, if special and appropriate arrangements can be made with the teacher. The foot must be persistently kept at a right angle.

Too often it happens that, in spite of all treatment, the joint goes on from bad to worse. The ankle becomes more swollen, the amount of discharge increases, and the child's health begins to suffer. There are then three courses open :—*erosion*, *excision*, and *amputation*. No active surgical interference should at once be proposed, but examination should be made under chloroform, and, if necessary, the joint further drained. The child should be watched, the urine examined for albumen, and nothing decided undertaken unless the health be found seriously affected ; and then most likely amputation will be needed. It cannot be too

strenuously advocated that conservative principles guide one in dealing with chronic ankle disease. Even when the joint appears completely wrecked, improvement may suddenly and quite unexpectedly set in, and recovery take place, and giving sometimes a partially movable joint. From the beginning to the end of the treatment the child must not be allowed to bear any weight on the foot. Drainage should not be abused; tubes must not be of too large a calibre, and they must not be left in for too long a time. A full-sized tube remaining in a joint may be a source of needless irritation.

For an *erosion*, free openings are made into the joint through some cloaca, which is perhaps partly blocked by unhealthy granulation tissue. This measure also comprises scraping unhealthy tissue, and gouging diseased bone, swabbing out the joint with a stimulating antiseptic fluid, providing for free drainage, and then including the joint within the firm compression of antiseptic dressings, and the fixation of the foot at a right angle. If the cloacæ leading into the joint do not readily serve for the introduction of the spoon, incisions may be made at the side of each malleolus, through which the sodden and unhealthy granulation tissue may be scraped out. I must confess that I have not found erosion (or arthrectomy) of the ankle joint so successful a measure as that of the knee joint (page 476), still, when proposing operative measures for a chronic disease of the ankle, if we could be certain that disease did not extend beyond the tibio-astragaloid articulation, the procedure might be undertaken.

Excision is very rarely needed. Incision, with scraping, will probably answer as well as the more formidable operation of resection of the ends of the tibia and fibula, and the partial removal of the astragalus. In cases where incision and the full adoption of the expectant treatment prove futile,

probably no measure short of amputation will avail.

Excision could be performed by a longitudinal incision over each malleolus; in this way the peroneal and tibial tendons escape injury. The first incision is made down to the tip of the outer malleolus. Then the knife is laid aside and the periosteum-raspatory used; the fibula is cleared and divided, and the malleolus extracted. So also with the inner malleolus. The surface of the astragalus would be gouged, or treated with the spoon. Washings, drainage, and sutures are arranged, and the foot is surrounded in a packing of wood-wool, and secured on a rectangular splint, the heel being kept from pressure.

Syme's amputation may be required for neglected joint disease in unhealthy, ill-fed children; but it is rarely needed in the well-to-do classes of society, in which the patient is likely to have been under the influence of close surgical attention from the commencement of the trouble, and the surroundings are calculated to promote recovery. Immediately the mass of diseased tissues is removed, the child begins to mend. Anxious, sleepless, and exhausted as he was before the operation, he is henceforth at rest and happy. The pinnacles of the temperature chart sink into slight upheavals from the normal line, and even on the day following the operation the child may be found amusing himself with toys or pictures.

The operation. — Chloroform having been administered, the splint should be removed, and the leg and foot cleansed. The limb having been raised, to empty it of blood, the circulation may be controlled by an elastic band round the thigh. Then the tip of the external malleolus is noted, and a spot upon the inner side of the ankle, which exactly corresponds with it. This is somewhat below and behind the tip of the internal malleolus. These two points mark the

extremities of an incision which is made around the plantar aspect of the heel, and which divides all the structures down to the bone. The best knife for the purpose is a short-bladed scalpel. The incision should slope a little backwards towards the point of the heel, or else, when the os calcis has been enucleated, the cup-shaped flap will be found unnecessarily large and deep.

A second incision straight across the front of the ankle connects these same points; it should not be made with the idea of shaping out a flap.

Then the foot is firmly depressed, and the knife made to traverse the ankle joint, which is opened by dividing the anterior and lateral ligaments. Carefully the knife is to clear the loose tissue from along the upper aspect of the os calcis behind the astragalus, then round the posterior part of the os calcis, through the insertion of the tendon of Achilles, and all around the sides and base of the bone within the limits of the incision; but whilst enucleating the heel-bone, the skin may be wounded unless the point of the knife be guardedly kept close against the bone.

The articular surface of the tibia is cleared and sawn off if diseased, otherwise it will suffice to remove the malleoli with a strong scalpel or cutting pliers. The cut ends of the tibial arteries (or the two plantars) are to be looked for and secured, and any long-cut tendons pulled down and shortened with the scissors. Then the elastic tourniquet may be gradually slackened, and bleeding points seized with pressure forceps. All the diseased surfaces must be scraped over with the spoon, and the cavity dealt with as described under the heading "Arthrectomy."

When all bleeding has ceased, a small drainage tube, or a strip of indiarubber tissue rolled up like a spill, may be laid across the wound, and the flap

adjusted by sutures. Liberal washings with sublimate solution may be used, and the wound packed around with iodoform wool, or some similar material; the limb being secured on a back splint and raised. Next day the wound may be dressed and the drainage diminished; after this, the less the stump is meddled with the better.

The **fallacies** in the operation are in not making the inner end of the incision on the exact level with a spot immediately below the tip of the external malleolus; in attempting to shape a dorsal flap, and so getting the second incision in advance of the tibio-tarsal joint, and then opening the astragalo-scaphoid joint. (By forcibly depressing the foot, and feeling the flexure of the ankle joint, this error is not likely to be committed.) In bringing the first incision so far forward in the sole, that the cup of the heel flap is awkwardly large. If the incision be sloped too much towards the point of the heel, the flap would be too small, and the weight of the body, when the stump had healed, would be received by a surface of skin less suited for the purpose than the ordinary heel tissue. In scoring the flap when enucleating the os calcis: this accident is less likely to happen if the flap be dissected from above instead of from below, and if the blade be short, and kept well in view. The left index finger applied to the skin behind will give information of the thickness of the integuments between it and the knife. Sloughing of the flap is extremely unlikely to happen if the flap be not cut too long, nor too thinly raised from the bone, nor pulled and twisted during the operation.

Appreciation of Syme's amputation.—It is as ingenious in design as excellent in practice; and I do not remember ever having seen it turn out even partially unsuccessful. Though the integuments may be discoloured, thickened with œdema, and riddled

with cloacæ, its performance need not be precluded. Even in the most unpromising case it should be preferred to amputation in the lower third of the leg. The stump is excellent for supporting weight. It is not liable to excoriation, and the cicatrix is raised out of the way of pressure.

Neither Chopart's, Pirogoff's, nor any other partial amputation of the foot should be undertaken in the case of chronic ostitis; the disease is always far advanced or extensive when the question of amputation is discussed, and what is demanded is that the child be freed at once, and absolutely and permanently, of his trouble. A partial amputation is likely to leave diseased bone behind, and to prove a disappointing economy.

CHAPTER XXXIV.

DEFORMITIES OF THE FOOT.

Supernumerary toes, like supernumerary fingers, may be traced to hereditary transmission. The former are of slight importance, the foot being hidden from view, so that unless the additional toe be in the way it may be left uninterfered with. If there happen to be several superfluous toes, trimming may be advisable. In the case of a toe being attached by simple fibrous tissue and skin, the connection may be severed. **Webbed toes** should be left alone.

Pes gigas is congenital hypertrophy of part or the whole of the foot. The skin is coarse, the subdermal tissue is infiltrated with fat, dilated veins, capillaries, and lymphatics, and the bones are overgrown.

Sometimes only one or two toes are thus enlarged; sometimes the over-growth extends up the leg. The *treatment* should consist in even and gentle pressure with an elastic cotton roller, or, if necessary, with a fine Martin's bandage. Compression should be carried out with care and perseverance, and amputation should be resorted to only in extreme cases.

Arrest of development, or congenital hypertrophy, may affect the whole, or part of one, or both feet; the surgeon can do nothing to improve the condition.



Fig. 81.—Annular Constriction. Congenital.

Annular constrictions may be found in the limbs, extending like a deep and narrow groove almost to the bone; I believe that they are associated with simple error of development rather than with the contraction of circular bands, the result of intra-uterine inflammatory deposits. If the chink seemed to be suitable, the opposed surfaces might be denuded by careful dissection, and the edges adjusted by suture, the linear wound

being dressed with salicylic wool.

Club foot may be congenital or acquired; of the former variety, the commonest is that in which the sole is inverted and the heel raised, *talipes equinovarus*. It is a combination of two defects, neither of which by itself is often met with at birth.

It is an interesting speculation as to what may be the cause of the frequent occurrence of equinovarus: in utero the feet are in position of inversion and extension just before birth. This seems to be enforced by the muscular walls of the uterus, in order that the space occupied by the foetus may be reduced to the smallest limit.

. Such a mechanical theory is the most satisfactory for the majority of cases. The histological integrity of the nerve centres and of the parts concerned, as demonstrated *post mortem* in some cases which have died from accidental causes, and the possibility of completely restoring the normal function and position of the deformed limb, are facts opposed to a nerve origin, or a developmental error in the limb.*

At and soon after birth a slight amount of talipes varus is generally recognisable, though it does not require surgical treatment. It may be that in the first few weeks of infancy this natural twist of the foot is effaced in a gradual development. If, from tightness of the intra-uterine packing, or from the special compression of the uterine walls, the twist of the foot be rendered extreme, development during cradle-life might fail to procure its effacement. Unless the deformity be dealt with surgically, the foot and leg will remain undeveloped, from want of proper exercise, the os calcis being particularly small. The inner border of the foot will be drawn more upwards, and the weight of the body in progression will fall on the cuboid bone, the base of the fifth metatarsal, and the external malleolus. In these situations the skin will become hard and cornified, and bursæ will be developed between the skin and the subjacent osseous projections. Occasionally there is a considerable amount of rotation of the tibia upon its vertical axis, either outwards or inwards, more frequently the latter. If heavy boots or casings be applied to the foot and ankle, outward rotation is extremely likely to be produced.

The **treatment** varies with the degree of deformity. A slight amount of inversion is to be expected just after birth ; this may entirely disappear of itself,

* See Paper by Messrs. Parker and Shattock in Trans. Path. Soc., 1884.

though most children and young adults tread more upon the outer border of the foot than the inner. A greater degree of inversion might not get well by itself, though it will yield to frictions and manipulations carried out by an intelligent nurse. Three or four times a day the foot and the muscles of the leg should be rubbed and kneaded, the heel drawn down, and the foot methodically untwisted. If after a few weeks of this treatment the condition do not appear to improve, though the employment of a slight amount of force suffices to place the foot in the desired position, it may be evenly enclosed in a domette roller, or a soft, closely-fitting sock, and surrounded with a plaster of Paris bandage, being held in the straight position until the plaster has firmly set. It may then be left uninterfered with for several weeks, at the end of which time, the twist having disappeared, the parts may be treated by massage and exercise, or the foot may be readjusted with fresh gypsum. Probably several casings will be required before the foot can be entirely freed of restraint.

In this way a considerable amount of inversion and extension may be successfully dealt with. The younger the infant thus to be treated the better. So soon, indeed, after birth as the infant has been washed the deformity should be dealt with, the tendon of Achilles being divided without hesitation if there be any considerable elevation of the heel. Procrastination or temporising, so often adopted from a mistaken kindness to the mother, is a grievous injury to the child.

After the foot has been for about half-an-hour in the strained position ensured by the plaster, discomfort seems to have worn off. It is not so, however, when a child is being treated with a Scarpa's shoe; in that case the improvement is obtained chiefly through the localised pressure of narrow straps, a

pressure which creates a constant irritation, and which, causing a chafe or sore, demands a vexatious discontinuance of treatment. With the gypsum bandage the pressure is evenly distributed over the foot in the corrected position, and with due care no sore should occur.

When the gypsum splint is applied the end of the sock should be cut off, or the soft roller so arranged that the mother or nurse may be able to watch the colour and general appearance of the toes. If they become dusky, or be constantly cold, the casing must be at once removed, and the child brought for inspection, and probably for further adjustment. Rarely, however, does the bandage demand removal.

Great good may be effected in certain cases by the use of a well-fitting Scarpa's shoe, but the supervision of the treatment must not be given over into the hands of parents or nurse. Constant inspection is needed, lest the skin become excoriated, ulcerated, or gangrenous. The foot should daily be taken out, and submitted to frictions and manipulations.

The bandages are made of crinoline muslin torn into strips about two inches wide and two yards long, freed from size by boiling, and rubbed on each side with fresh, dry gypsum. They should be loosely rolled ; if kept in a dry place they will be found good and serviceable at the end of many months. When wanted for use they should be dipped into a tea-cup which has been half filled with warm water in which a little salt has been dissolved. They are not to be *soaked*. They must be applied quickly over the sock, from the toes upwards, and just as they are beginning to get stiff the foot should be twisted into and held in the desired position ; the casing becomes as hard as a brick.

The plaster of Paris method enables one to treat the club foot of a tender infant with security and

success, and without the expense of a mechanical apparatus requiring daily attention, and, even then, occasionally making the skin sore.

Thus children may be dealt with in the out-patient department of a hospital, or in the outlying districts of a country practice, with as much convenience and success as if they were inmates of a hospital.

Tenotomy.—If after some weeks of the simple plaster of Paris treatment, the position of the foot, though improved, be not entirely corrected; if there remain considerable inversion of the sole and some drawing up of the imperfectly-developed os calcis, tenotomy must be resorted to.

Hitherto it has been much the custom to advise that the inversion of the foot should be dealt with by the division of the tendons of the tibial muscles first, the elevation of the heel being attended to at a subsequent period. The reason of this separation of the treatment into two regular steps was that the heel might be left as a fixed point from which the transverse working of the mechanical shoe might be effected. Then when the fixation of the heel was no longer needed, the tendon of Achilles was divided and the gradual flexion of the foot proceeded with.

With the use of the gypsum rollers this practice gives place to the simpler one of dividing the tendon of Achilles to start with, and then, with the employment of some force, of bringing the foot at once into position.

This large tendon is often the head and front of the offending, and, having contracted to the utmost in drawing up the heel, it has obtained a still further shortening by twisting the os calcis inwards on its antero-posterior axis. Thus its division reduces, if it does not efface, each element of the deformity.

Several times it has happened, when speculating as to which tendons would require division, to find all

inversion disappear on section of the large heel tendon.

Operation.—For division of the Achilles tendon simply, it is not necessary that an anæsthetic be administered; the tissues implicated are not highly sensitive. But if there be a shortness of assistance, or if the child be frightened, or strong, or the position of the tendon not perfectly accessible, chloroform may be given.

The region of the proposed operation having been washed, the child should be laid prone; the nurse steadying the body and arms, whilst an assistant takes firm hold of the one leg and prevents the other from interfering with the operation; this last point deserves attention. Then the surgeon flexes the foot and seeks out the most slender part of the tendon; which is at some slight distance above the insertion into the os calcis.

If the child be small the foot may be flexed with the left hand whilst tenotomy is performed with the right, the strain on the heel tendon being diminished as the knife passes through, so that the edge does not complete the section with a jump, and wound the skin. If an assistant hold the foot, he should clearly understand that he cease the flexion before the section is completely effected.

Two knives are required, one with a sharp point for clearing the way beneath the tendon, the other with a blunt, round end for dividing it. The second knife is laid close at hand, and its blade introduced immediately on the withdrawal of the first; it is, like the first, introduced upon the flat, and close beneath the tendon. The point being rounded, there is little likelihood of the skin being implicated after the section of the tendon, but to render this contingency still less likely, the tip of the left index finger should be kept on guard over the skin at the line of section.

It is better not to introduce the knife between the skin and the tendon, lest, after the section, the edge should suddenly come against the posterior tibial artery. When there is much deformity the tendon is likely to be placed close behind the course of the artery.

Having ascertained that all the fibres of the tendon are divided, a small pad of dry lint is strapped over the puncture in the skin and secured with a few turns of a soft roller. The foot is then enclosed in the

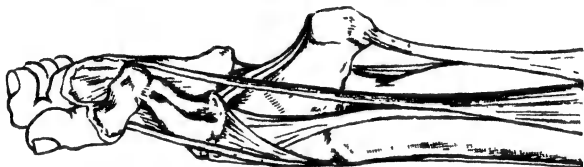


Fig. 82.—Tendons at Ankle in Talipes Equinus.

gypsum bandage, and immediately twisted into and fixed in the most improved position; this is a great gain on the old method of waiting some days before straightening the foot. There need be no dread of suppuration in the wound, nor of failure of a firm fibrous splice connecting the ends of the severed tendon. It is different, however, when a tendon is divided in its synovial sheath; then it is quite possible that its sundered ends may fail to be connected.

As regards the ultimate non-union of the cut ends of the tendon (a contingency of the rarest occurrence), the surfaces may be vivified and approximated in the extended position of the foot by the use of a few catgut sutures, the wound being treated with antiseptic precautions. When the union is secure the heel may be brought gradually down either with or without a fresh tenotomy.

The old treatment of club foot consisted chiefly in tenotomy and in the stretching of obstinate ligaments and fasciæ ; the modern one demands section not only of tendons, but of ligaments, fasciæ, and all tight bands ; forcible rectification, and subsequent manipulations and frictions. The short bands which are mostly in need of section are at the front of the internal lateral ligament of the ankle and at the astragalo-scaploid joint. They, together with the insertion of the tibialis posticus, the abductor, and the long flexor of the great toe, may be cut across through a long open wound between the front of the malleolus and the tuberosity of the scaphoid. In extreme cases the tendon of peroneus longus will need division, as it keeps the foot extended and prevents the lengthening out of its inner border. The surface of the foot and the fingers and the instruments of the operator being absolutely clean, the surgeon need have no fear about making a deliberate and open attack upon all offending ligaments, tendons, and fasciæ. Subcutaneous tenotomy is rapidly making way for the antiseptic and more thorough method of treatment, and the old operation of tenotomy of the tibial tendon above the ankle will likely be discarded ere long. It was never very satisfactory, for the relief which it by itself afforded was rarely complete and permanent.

When the operation of dividing all these tendons and fibrous bands has been efficiently accomplished, and the foot has been duly unfolded and straightened along the inner side, there is, of necessity, a wide and deepish wound just behind the scaphoid. Indeed, this wound, in all probability, extends into the astragalo-scaploid joint, for the scaphoid has to be dragged forwards. The extent of this wound need cause no anxiety. After it has been washed over with an antiseptic lotion, and has been dried and lightly dressed with mercuric gauze, the wound gives no

further trouble. Probably it need not be inspected for several weeks, when it will be found nearly filled with healthy granulations.

The more that I see of this operation the more pleased I am with it; it is so much better to divide the tendon of the *tibialis posticus*, for instance, where it can be seen and felt than, in a somewhat speculative manner, as it runs near the artery above the ankle. By the open method nothing is cut in the dark, and there is no artery in the way of the knife. Such an extensive operation could not have been done with safety in the pre-Listerian days, but now a careful surgeon can undertake it without apprehension.

If the amount of inversion be slight, it will not be necessary to perform so serious an operation as that described above; but in all cases it is better to divide the tibial tendons below the level of the ankle.

When adjusting the gypsum bandages, Dr. Willard's advice should be followed: "An assistant steadies the leg at the time, while the operator's palm presses flatly upon the patient's sole, so that by its adhesion it shall exert nearly all of the straightening power in overcoming the equinus and varus. The hooked fingers should make slight pressure opposite the shaft of the first metatarsal bone, but never upon its head, and all indentation of the casing upon the dorsum of the foot should be avoided. By this means the greatest strain will be brought to bear upon the tough skin beneath the base of the fifth metatarsal bone. The day after the operation the splint may be split up and reapplied. Frequent stretching, massage, and frictions will be subsequently required. Intelligent and persistent manipulation is one of the most important features of the treatment." "If surgeons would but remember that the oldest and best club foot straightener is that which has been in use

since the time of Hippocrates, viz. the hand, there would be fewer cases of relapse after operation."

After the deformity of the foot has been corrected the child should not be allowed to put on the boot or shoe which he wore before the treatment was begun.

Contingencies.—Though I have seen the skin above the heel much injured with the knife, and even torn through, the wound has quickly healed under dry dressing.

If the section of the Achilles tendon be made from the deep aspect of the tendon backwards and towards the skin, there is little chance of bleeding. In dividing the posterior tibial tendon in the leg, there is a considerable chance of the artery being wounded. Probably the accident has happened more often than it has been recognised. In the event of its occurrence a thick pad of dry lint should be firmly secured over the wound, the foot being also bandaged from the toes upwards. Digital pressure might be employed if necessary, and no attempt should be made at flexing the foot for about a week. The foot should be kept warm and quiet. At the time of the accident no heroic measure need be contemplated.

Partial excision of the tarsus in the treatment of club foot, though sometimes necessary for the adult, can rarely be justifiable in childhood. With plaster of Paris, after free employment of the knife, the most extreme deformity of childhood can be greatly improved, even if it cannot be entirely removed.

If, however, relapse has followed relapse, and the deformity prove altogether intractable, some form of *tarsotomy*, as it is called, may be necessary. Of the various operations I would give preference to that of Mr. Lund, who enucleates the astragalus, and allows the upper surface of the os calcis to ascend between

the malleoli, where, in due course, an excellent joint may become established.

The subject of **talipes equinus** scarcely requires separate consideration after what has been already said of it in its association with inversion of the foot.

Congenital talipes calcaneus can, as a rule, be easily corrected in infancy by systematic frictions and manipulations carried out by the nurse. If the deformity prove obstinate, the foot might be straightened out under chloroform, and fixed in the extended position in plaster of Paris. Subcutaneous division of the tendons at the front of the ankle is little likely to be called for.

Cases have been reported* in which paralytic calcaneus has been treated by excision of half or three-quarters of an inch of the elongated tendon of Achilles. The ends of the tendon were cut obliquely, so that when brought together they overlapped splice-wise; in this shortened condition they were sutured. Much power was regained, but when the whole of the calf muscles have undergone fatty degeneration little benefit could be expected from the operation.

Talipes valgus, as a congenital defect, is rare. If the deformity cannot be cured by frictions and manipulation, nor by the methodical employment of plaster of Paris, it might be necessary to divide the peroneal tendons. But if the treatment with plaster of Paris be begun early, it is unlikely that tenotomy will be required.

Pes cavus, or *hollow club foot*, is a rare deformity; it is probably of congenital origin.

Case.—As the boy (from whom Fig. 84 was made) walked, the chief part of his weight was received by the ball of the great toe, where the integument was thickened, inflamed, and tender. A long walk

* *Brit. Med. Journal*, 1884; pp. 1058 and 1147.

distressed him, and caused him to be kept off his feet until local quiet was restored. The instep was highly arched, and the muscles of the sole of the foot were so thinly spread out beneath it as to suggest the idea that the deformity might be in some way associated with their paralysis; but they responded fairly in electrical examination, and their substance could be made out when they were thrown into a state of contraction. The plantar fascia was stretched like a bow-string, from heel to root of toes. The heel was slightly drawn up, and when the knee was kept extended the gastrocnemius did not permit the usual amount of flexion at the ankle joint. The great toe, as constantly happens in talipes equinus, was much crooked up. But on flexing the foot to

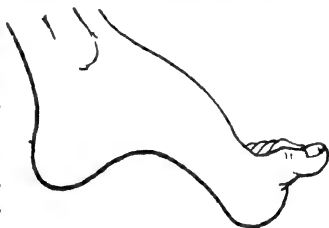


Fig. 84.—*Pes Cavus.*

the utmost, and so slackening the extensor proprius hallucis, the digit came down to its proper level. Then, on again extending the foot, the first phalanx was well-nigh completely dislocated on to the back of the head of the first metatarsal bone.

The **treatment** involved the subcutaneous division of the thick band of the plantar fascia, the long extensor tendon of the great toe, and the tendon of Achilles. The foot and ankle were enclosed in lateral splints of plaster of Paris, and placed in a greatly improved position. After about ten days the casing was taken off, and a course of massage adopted.

The result of the treatment adopted proved highly satisfactory; the boy was able to run and walk without any of his old trouble. When he was seen after some weeks of exercise, the skin beneath the head of

the first metatarsal bone was no longer tender. But I must confess that subsequent experience of operations in like cases has not so favourably impressed me.

Causation.—By an ingenious theory, this deformity has been ascribed to paralysis of the interosseous muscles, which have, as part of their office, the flexion of the first phalanges and the extension of the others. Though this explanation may be available in certain cases of so-called "*claw foot*," it has no connection with the deformity now under question. Possibly it may be due to some cramped position of the foot in utero. In *pes cavus* the toe which is most clawed is the great one, and that possesses no interosseous muscle.

In certain cases of **lameness** without apparent cause, the error is due to slight talipes equinus, and it is very apt to be overlooked.

When one is told that a child limps without evident reason, he should be stripped and laid flat on his back on a firm bed, and the presence of hip-disease excluded. The knees and ankles are examined, and the equality of the limbs tested; then the points of the heels are placed together on an even surface, such as a book, and it is seen if the feet are of exactly the same length. Then it is noticed if the feet are capable of the same amount of flexion upon the leg. In each case the angle at the front of the ankle should be reducible to somewhat less than 90° , whilst the knee is extended.

If one ankle yield less than the normal amount, the probability is that there is contraction in the calf muscles, in which case the circumference of the leg will be less than on the sound side. The amount of the difference in the development of the two legs may be nicely estimated by encircling the calves in the grasp of the fingers and thumb. In all cases of raised heel, the tip of the sole of the boot will be used up

before the rest shows signs of wear. If the child be made to stand upon the table, and told to bear his weight evenly upon the two feet, the knees being straight, it will be found that a sheet of paper can be passed under the imperfectly developed heel.

The limping will entirely disappear after section of the tendon of Achilles. To treat it by simply increasing the thickness of the heel of the boot is to obtain but specious relief, and to prevent the proper development of the heel, the foot, and the entire limb.

Deformity of the feet as the result of infantile paralysis is an unsatisfactory matter for treatment. The leg is cold and wasted; the foot extended or inverted, perhaps both; horny patches may be formed upon the skin, wherever unequal pressure is received; the child swings the foot in a characteristic manner. The elevation of the heel after infantile paralysis is due to an atrophic shortening of the unopposed muscles rather than to a physiological contraction. The child may even walk on the dorsum of the foot.

If the muscles on the front of the ankle be paralysed, so that the posterior group are unopposed in their action upon the extension and inversion of the foot, the tendons may be dealt with as for a congenital defect (page 517).

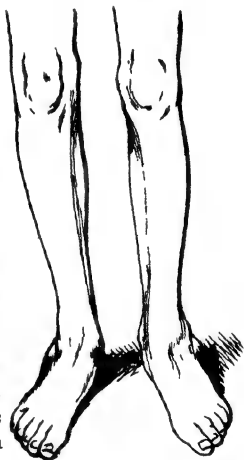


Fig. 83.—Splay-feet, from Paralysis of Inner Tibial Muscles.

In this way a splice is put into the tendon, and the acquisition of the normal position becomes possible. The foot is then fixed at a right angle.

Case.—A girl of about nine or ten, with extreme talipes equinus of each foot, the result of infantile paralysis, had for years walked only upon the tips of her toes, but soon after the division of the tendons she walked flat and well. No indiarubber springs or strappings could have accomplished such results, even if the enfeebled skin could have borne their pressure. If a foot is to be comparatively useless, at least let it be so in as nearly the normal position as possible. In extreme cases it may be advisable to scrape the ankle joint, and having flexed the foot to a right angle, to arrange for the occurrence of bony ankylosis; but I must confess that my own experience of the operation of establishing a synostosis of the foot in childhood has not proved satisfactory.

Persistent inversion of the foot may be due to the presence of a sore about the ball of the great toe. If the sore be not cured, it is likely that the muscles on the inner side of the ankle would in time undergo so much shortening, as to produce uncomplicated talipes varus.

Hammer toe is a congenital deformity, in which the first phalanx is raised above the level of the dorsum of the foot, the second phalanx being bent down again, so that the first interphalangeal joint presents a salient angle upwards. In early childhood the digit may perhaps be permanently straightened out by repeated manipulations by the nurse; or, by weaving a strip of adhesive plaster over the hammer toe and under its neighbours, arranging it so that it not only keeps the toes on the same plane, but that it also gets a firm hold. If the toe be still unmanageable, a digitate steel plate with a strap for each toe may be worn under the sole of the foot night and day,

a specially large boot being made. In a case under my care, which could not be remedied even by free tenotomy, it was found that the plantar fibres of the lateral ligaments were short, and that the head of the phalanx had slipped up between them and was there rigidly grasped. In a severe case, division of the flexor and extensor tendons is likely to be attended with disappointment—the toe may be kept down for a while, but it soon resumes the vicious position. The more thorough treatment consists in subcutaneous division of the lateral ligaments, in excision of the head of the first phalanx, or in amputation of the toe. The last operation has much to recommend it, and in a severe case had better be resorted to straightway. In any operation short of amputation treatment must be persisted in for at least a month.

Flat feet and weak ankles are often associated in feeble children, but sometimes they occur in children who are in every other way strong and flourishing. Most infants have the weakness in some degree, but it is only when they begin to “find their feet” that the defect attracts attention. The ankle gives way upon the inner side, much as it does in an awkward boy who is making his first attempt at skating. The condition is not serious, but if the surgeon make too light of it the mother will be apt to go elsewhere for assistance, perhaps to a “bone-setter.”

For the subject of flat foot and weak ankles occurring at puberty, *see* page 72.

Treatment.—The child must be taken off his feet. Perhaps it is a first-born, and the mother is too anxious about its physical development, and is unconsciously overtaking the strength of the tarsal arches and ankle joint. All this should be stopped, and the ankles must have a complete rest; also proper diet and tonics must be prescribed. The rickety child, too,

with a heavy trunk, big, flabby limbs, a large head, and weak bones and ligaments, is very apt to "tread over" at his inner ankle.

To the ankle itself strength may be directly imparted by shampooing. Sea salt may be dissolved in the bath water. This water may be used warm at night, and cold or tepid in the morning. The parts should be well dried and rubbed in the direction of the return circulation, and warmly covered in worsted socks. The feet and legs should never be allowed to get cold. If they become so during the night, the child should sleep in wool socks; or a warm bottle, or a warm brick wrapped in flannel, may be tucked in at the foot of the cot. High heels are bad, as are, of course, tight garters. The mother will probably ask if, for the sake of the extra support, lace boots are advisable. The slight support which they could afford would be secured at the risk of retarding the free circulation which is so necessary, whilst to admit the support would be to suggest to the mother or nurse that, with it, the recourse to the other measure is, after all, not essential.

Flat feet.—All the structures supporting the tarsal arches are relaxed; the muscles and tendons of the leg and foot, and the plantar fascia and ligaments; so the astragalus and scaphoid sink inwards, and the foot is splayed outwards. The feet ache, and the child complains of pains in the legs.

It is in vain that the instep of the flat-footed child is surrounded with a strap, or the ankle encumbered by an iron support; such measures are often carried on with serious expense, and abandoned in disappointment. Perhaps the child is altogether out of health, and requiring change of air, and other tonics; or he may be standing too much at school or work, or frequently carrying weights too heavy for him.

In the case of the flat-footed girl one may find

that there is a heavy baby or young child that she is constantly carrying about; or she may be standing through many hours at her usual work, or walking a long distance to and from it daily. The boots should be examined; possibly they have high heels and narrow toes; such heels give no fair support, and allow the foot to fall inwards, and to receive unequal strain. Often this form of flat foot is associated with obscure pains along the front or back of the leg. I have known such a patient treated for "rheumatism." Flat feet may result from atrophy of the posterior tibial muscles, the effect of infantile paralysis, the legs being much wasted along the inner aspect (Fig. 83).

Treatment.—The feet must have rest, and be fairly shod; old and badly fitting boots should be discarded. Frictions and shampoos, rubbings and kneadings, are to be methodically carried out; the child must be taught to exercise the enfeebled muscles, so as to impart to them renewed strength and vigour. She should also be shown how to cause the tibialis anticus and posticus, and the flexors of the toes, to contract until the inner border of the foot can be drawn up at will, and until at last she can, in standing, support her whole weight on the outer side of the foot. She should be made to walk about on the outer border of the feet until she is tired. This exercise should be done every morning, noon, and night; after a short time, when improvement becomes evident, the child will take interest and pleasure in it. When these gymnastic exercises are earnestly and patiently carried out, and are supplemented with daily massage of the muscles, great and permanent improvement is sure to follow, provided that the giving way of the arch is not due to infantile paralysis.

The boots should be after Thomas's pattern, with the heel and sole raised all along the inner side, as

shown in the adjoining sketch. The heel and sole are made to form a continuous surface along the inner side of the shoe. The design is much more efficacious than that of attempting to raise the instep by a pad of leather or cork, or a steel spring, placed inside the boot. We should not aim at receiving the weight of the body through the weak inner border of the foot, but must try to throw it along the solid outer border, by arranging the heel and sole along the

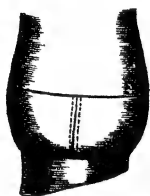


Fig. 85.—Heel of right boot for Flat Foot.

inner side, after the manner of the thick part of a wedge. A bootmaker who has a little common sense, and will do exactly what he is told, can thus, in the course of an hour, convert a pair of the child's old boots or shoes into the most efficacious "supports;" unfortunately, however, the bootmaker usually believes that he knows a more excellent way. A grown girl may object at first to the ungainly appearance of the wedge-soled boots or shoes (for shoes do as well), but she soon finds great comfort from them, and comes to like them. As she improves, the low heel-end of the wedge may be separated from the sole part, but still, for a long while, the inner side of the heel should be carried well forward under the instep, so that the effect of the wedge may not be lost.

Seeing how, with careful supervision and attention, children grow out of their flat-footedness, the propriety of performing any cutting operation on bones or tendons should not be contemplated. The forcible manipulation of the foot under an anæsthetic is hardly likely to be required, nor is the more serious operation practised with success in the adult by Ogston, of pegging together the freshened surfaces of the astragalus and scaphoid bone. If, however, the deformity be so severe and intractable as to demand

heroic measures, the wrenching and inversion of the foot (under chloroform), the thrusting up of the astragalus, and the subsequent enclosure of the foot in the improved position in plaster of Paris is the preferable operation. On leaving off the gypsum, the special boot, as designed above, must be worn, raising the inner border of the foot.

CHAPTER XXXV.

DISEASES OF THE FOOT.

LIKE the vertebræ, the tarsal bones consist almost entirely of spongy tissue; they are much exposed to injury. Interspersed amongst the osseous segments, there are many folds of synovial membrane which are ready from any strain or hurt to become inflamed.

Whether tarsal disease begins more often in the bone or the synovial membrane cannot be certainly affirmed, but the trouble may quickly extend from the one tissue to the other, till the whole tarsus and metatarsus are involved. The disease may begin as a pulpy synovitis or tubercular osteitis. It is usually chronic. The child complains of his foot "hurting" him, or "aching," and at first there may be no local indication of disease; but the parts soon become swollen, and the skin grows dusky. In due course an abscess forms, and is incised, or, finding its own discharge, an indolent cloaca remains, from which a thin fluid is constantly oozing. The skin-opening is in time encircled with a ring of unhealthy granulations, and becomes adherent to the subjacent tissues, even to the bones. Probing such a sinus distresses the child, and as

it must be already abundantly certain that diseased bone is exposed in the depths, the probe affords no information of a fresh or practical value. Nor is it necessary that the surgeon inquire too closely as to which bone or joint is specially diseased. The information can be only obtained at the expense of harmful examination, and will in no way alter the treatment.

The **astragalo-scapoid** joint is, on account of its size and range of movement, specially apt to be attacked, and, the astragalus itself being invaded, there is a great risk of the disease extending to the ankle joint itself. Indeed, in whatever part of the tarsus the inflammation may arise, it is apt to ignore all anatomical boundaries, and spreading from joint to joint and bone to bone, to involve the whole foot. (*See also* page 501.)

The **treatment** should be begun on the first indication of alarm. The foot, ankle, and lower half of the leg should be enclosed in lateral leather splints or gypsum; and for a short time, if only to impress the child with the need for care, he should be kept in bed, with the foot raised on a pillow. No counter-irritation or local application of any kind, beyond the dry compression just described, will be required. If the patient can be trusted, he may be allowed to go about with a high boot or patten on the sound foot, as shown in Fig. 79.

The general treatment will be upon the lines laid down on page 261, whilst "masterly inactivity" should characterise the direct treatment of the diseased tissues. It is often advised that carious patches be scraped over, destroyed with sulphuric acid, or even excised, but to make use of such measures may be unnecessary and disappointing. No probe or other instrument need approach the foot, though if in the course of the disease a sequestrum be found working its way out, it may be removed by the dressing forceps.

Some surgeons are, I know, in favour of gouging, and of partial resections in the case of chronic tarsal disease, but I confess that my own experience does not lead me to recommend it in strong or general terms. When a bone is carious its fellows are apt to be soft ; and if one introduces a scraping or cutting instrument he is apt to do needless injury to the softened tissues. I endeavour to deal with chronic disease of the tarsus as with that of the vertebræ—I ensure perfect rest, open and wash out abscess, and improve the general health. No one thinks of gouging at carious vertebræ, even though their ulcerated surface is easily reached, as from the neck or loin, and yet hundreds of cases of vertebral caries get well. Contemporary surgery has grown restless and impatient ; and I feel sure that in the case of chronic disease of carpus and tarsus the desire to “do something” is often a mistake.

Caries of os calcis may remain confined to that bone. Small sequestra may come away with molecular, watery, or purulent discharge (caries necrotica). *Central necrosis* of the os calcis is a somewhat common disease, and, unfortunately, the astragalus and ankle joint are very apt to be affected secondarily. At first the redness and swelling are confined chiefly to the back of the foot, but in due course the neighbourhood of the ankle becomes swollen. If there be doubt as to the exact seat of the disease, an exploratory incision must be made into the os calcis, when, a sequestrum having been extracted, the disease may clear away ; and the foot may be saved. Delay in exploring in these particular cases is often regretted.

If under the influence of rest, drainage, and the administration of tonics and good food, the case do not progress, the inflamed tissue may be improved by scraping with a Volkmann spoon, by gouging, or even by the partial or complete excision of the bone.

It is better to excise the entire shell of the os calcis than merely to scoop out the chief part of its softened interior. I have seen excision of the bone prove extremely satisfactory and leave a useful foot in cases in which disease was evidently limited to the calcaneum.

But if many tedious months of expectant treatment hold out no hope of recovery, the supervision having been thorough, and the surroundings the best obtainable in the circumstances; if the boy be going backward rather than improving, the question of amputation must be considered. But, seeing what can be effected by time and rest, it is well that amputation be delayed to the utmost. (Syme's amputation, page 506.)

Incision and exploration under an anæsthetic should not be too readily undertaken; it is often the prelude to amputation; the multiplicity of the joints, the wanderings of synovial membranes, and the spongy condition of the bones, are a contra-indication of excision.

The **metatarsus** is often associated with the tarsus in disease; sometimes one or more of these long bones will be affected whilst the tarsus remains apparently sound.

The remarks made concerning the treatment of tarsal disease apply to disease of the fore part of the foot.

Chilblains are inflamed patches of skin produced by cold. They are met with chiefly on the feet and hands, as these parts are far removed from the centre of circulation; they may also appear upon the ears or nose. Girls suffer from them more than boys, as their circulation is less vigorous, and they are not generally accustomed to keep it brisk in cold weather by exercise. Chilblains are less apt to appear in bright, frosty weather than in the thaw which follows. They are caused by paralysis of the capillaries, exudation taking place into the substance of the cutis.

Strumous children are very liable to chilblains, as their tissues are feeble, and the circulation through them is slow and languid.

Three stages mark the progress of a chilblain ; first, the skin is a little swollen and red ; this is associated with itching, which becomes intolerable when the child gets warm in bed, keeping her restless and awake. By day the warmth of the fire, or that produced by frictions or exercise, will increase the irritability. The child can hardly keep from rubbing or scratching the burning place. In the second stage serum oozes from the engorged vessels, throwing up the epidermis into vesicles or blebs. The adjoining skin is dusky red, or purple. In the third stage the blood-stained serum has escaped from the bleb, and the purple skin yields to ulceration or gangrene. The chilblain is then spoken of as "broken."

Prophylaxis.—Some delicate girls are martyrs to chilblains, from late autumn to early spring. Much care should be given to the maintenance of the general health, and for this purpose cod-liver oil, iron, and other tonics may be duly administered, such as a small glass of port wine at lunch or dinner.

Every day, and twice a day, if expedient, the child should go out of doors for a brisk walk. She should wear strong, easy boots, and thick worsted stockings ; also a flannel vest up to the neck and long in the sleeves, and flannel drawers, and she should sleep in a flannel night-dress and bed-socks. Boots and stockings should be changed after the walk, and they should always be put on dry and warm. A tight boot is harmful in that it impedes the cutaneous circulation ; and a high heel crowds the toes together into the front of the boot. Thomas Smith gives a caution against the use of tight garters, and also against allowing the child to sit long in a cold room with the feet hanging down.

The hands should be covered in loose gloves, which are enclosed in worsted mittens, or are lined with fur; the boots, especially in damp weather, should be provided with an inner sole of cork. When the hands or feet are benumbed with cold, their warmth should be restored by friction; they should not be warmed at the fire. The plan, occasionally resorted to, of attempting to improve a child's languid circulation by cold baths, or by cold or barely tepid washings, is not to be recommended, cold or chilly water depresses the circulation. The hands and feet should be washed in quite warm water, and then carefully rubbed with a warm, dry towel.

The **treatment** is extremely unsatisfactory, as *a priori* might have been imagined when one sees the extensive list of remedies recommended. Billroth gives a long string of remedies, and suggestively remarks, "These will be enough for you at the commencement of your practice for dealing with this troublesome complaint. Sometimes one does good, sometimes another." In the first stage, frictions with the hand may do good by restoring circulation in the reddened area, and liniments may be tried. Probably it matters little as to what the ingredients of the stimulating embrocation may be; the linimentum camphoræ co. is much used, either alone or in combination.

Rubbing the skin with snow is a favourite and efficient means of exciting the circulation of cold hands and feet. In the later stages, frictions and liniments are out of place, but Friar's balsam may be painted over the raw surfaces. Hydrochlorate of cocaine, in solution, might afford relief, and a solution of corrosive sublimate might also be tried.

If sloughs be loosening, a small piece of lint soaked in dilute carbolic acid lotion might be worn under a rather larger piece of oil-silk. In these

circumstances exercise cannot be taken, nor ordinary shoes worn.

Chilblains upon the heel are frequently met with. They must be freed from all pressure of the boot. For this purpose the upper leather should be cut away, right down to the level of the heel of the boot, the gap being filled in by a piece of soft black kid. The sores about the heel may give rise to much suffering. They may be dressed with Friar's balsam, vaseline, and eucalyptus, or, as remarked above, with a solution of cucaïne.

Juvenile gangrene, Raynaud's disease, is a symmetrical gangrene of the fingers, toes, or other parts, which is apt to occur in children, especially during cold weather. The cause is probably spasmodic contraction of the arterioles, so that the distant tissues receive an insufficient supply of blood; the disease is, therefore, sometimes called *local asphyxia*. The gangrene is preceded by coldness, the skin being either blanched or dusky, and the tissues painful. The attack may be associated with hæmaturia.

A child was lately in the Louise Ward who thus lost several fingers and toes. The affected part becomes livid, and then black; the epidermis is raised in blebs, from which ill-smelling serum oozes. There is much constitutional depression, from which, or from some form of septicæmia, the child may sink.

The part should be dusted with iodoform, and wrapped in cotton-wool. There should be no rash interference in the way of cauterisation or amputation; a line of demarcation must be patiently awaited. In the meanwhile, everything must be done to improve the general health and vigour of the child. The temperature of the room must be kept up, warm clothes must be supplied, iron and quinine prescribed, and, according to Raynaud, the constant current should be applied along the spine.

(A translation of Raynaud's two essays on local asphyxia, by Dr. Barlow, was published by the New Sydenham Society in 1888.)

Perforating ulcer of the foot may be secondary to central disease of the nervous system. A case of this rare nature is reported in the *Lancet* of April 5th, 1884.

Scabies is apt to give rise to extensive irritation on the feet and hands. Sometimes the parasitic disease is associated with ulceration. The subject is dealt with in works on dermatology.

INDEX.

- Abdomen, Abscess of,** 251, 266
 —, Burn of, 158
 —, Pains in, 254
 —, Protuberance of, 71
Abdominal fissure, 280
 — median furrow, 71
 — section in obstruction, 341
Abscess, Absorption of, 250, 260
 — about maxilla, 195
 —, Acute cervical, 272
 —, Alveolar, 195
 —, Cervical, 267, 272
 — diagnosed from tumour, 393
 —, Fæcal, 275, 280
 —, Glandular, 115
 —, Gluteal, 251, 252
 —, Hilton's method of opening, 115, 272
 —, Hip joint, 445, 451
 —, Iliac, 251, 259, 349
 — in neck, 267, 272
 —, Ischio-rectal, 333, 352
 —, Lumbar, 268, 270
 —, Metastatic, 391
 —, Multiple, in infants, 8
 — near joint, 466, 501
 — of auditory meatus, 221
 — of parotid, 218
 — of tongue, 202
 —, Pelvic, in hip joint, 446
 —, Pericæcal, 350
 —, Popliteal, 108
 —, Post-auricular, 115, 224
 —, — pharyngeal, 257, 267
 —, Psoas, 251, 259, 266, 272
 —, Pyæmic, 8, 277, 391
 —, Residual, 250
 —, Retro-pharyngeal, 257, 267
 —, Sacro-iliac, 459
 —, Scrofulous, 61
 —, — spinal, 251, 259, 266
 —, Subperiosteal, 388
 —, Subpsoas, 446
Acetabulum, Disease of, 453
Achilles tendon, Section of, 503, 514
Aching legs from flat foot, 526
 " Acute necrosis," 383
Adenoid vegetations, 210
Air in veins, 184
 — passages, Foreign bodies in, 238
 — — —, Blood in, 43
Albuminuria in chronic joint disease, 270, 475
 — in diphtheria, 22
 — in relation to operations, 5
Alveolar abscess, 195
Amputation for disease of ankle, 504, 506
 — — — of elbow, 465
 — — — of hip, 457
 — — — of knee, 475, 484
 — in albuminuria, 457, 475
 — in compound fracture, 416
 — in malignant disease, 123
 — in phthisis, 475
 — in traumatic gangrene, 417
 — or excision, 450, 474
Amussat's operation, 329
Amyloid disease, 270, 475
Anæsthetics, 6
Anal prolapse, 309, 331
Angular curvature of spine, 253
Ankle, 499
 —, Abscess at, 503
 —, Amputation at, 506
 —, Disease of, 499
 —, Excision of, 505
 —, Incision of, 504
 —, Sprain of, 499
 —, Weak, 525
Ankylosis. (See special joint.)
Anus, 326
 —, Abscess at, 252, 373
 —, Absence of, 327
 —, Artificial, 328, 345
 —, —, in gangrene of bowel, 345
 —, Fistula at, 252, 333
 —, Imperforate, 327
Aphthous sores in mouth, 194
 — — — in vulva, 325

- Armslets, 437**
Arterial nevus, 141
Arthroctomy, 476
 —, ankle, 505
 —, knee, 476
Arthritis. (See special joint.)
 —, Acute, of infants, 396
 —, Syphilitic, 83
 —, when ended, 443, 473
Artificial anus, 327
 —, Amussat's, 329
 —, Littre's, 326
 —, respiration, 38, 48
Asphyxia from burn or scald, 242
 — from foreign body, 216, 238
Aspiration of joint, 445, 463
Astragalo-scapoid joint, Disease of, 502, 530
Asymmetry, congenital, 187
Atheromatous cysts, 189
Atlas, Disease of, 257
Atresia ani, 327
 — oris, 187
 — urethrae, 284, 294
 — vaginae, 297
Atrophy from infantile paralysis, 164
 — in joint disease, 435, 462
 — of limb, 124, 463
Attached foetus, 124
Attitude in hip disease, 430
 — in spinal caries, 253
Auricle (see EAR, EXTERNAL), 179
Axilla, Hygroma of, 128
Axillary glands, Enlarged, 107
Axis, Disease of, 256
- Bacilli in joint disease, 469**
 — in tuberculosis, 62
Back, Pain in, 254, 377
 —, Stiff, 252
Baker's tubes, 54
Balanitis, 288
Bandages, Plaster of Paris, 262, 264, 513
Bandy-leg, 97, 98
Bathing, 13, 99
Bed-sores, 7, 454
Belly-ache from spine disease, 254
 2-5
Bending of bones, 91
Bigelow's operation, 304, 311
Bladder, Development of, 274
 —, Exploration of, 302, 320
 —, Extroversion of, 281
 —, Irritability of, 300
 —, Polypi of, 322
 —, Rugous, 321
- Bladder, Sacculated, 302**
 —, Sarcoma of, 322
 —, Sounding, 301, 313
 —, Stone in, 300
Bleeding, Recurrence of, 58, 193
Blisters, 262
Blood tumour of scalp, 178, 418
Boils, 144
Bone, Acute inflammation of, 392
 —, Arrest of development of, after fracture, 406
 —, —, from infantile paralysis, 164
 —, Bending of, 70, 98, 385
 —, Enchondroma of, 133
 —, Exostosis of, 134
 —, Necrosis, 393, 396
 —, Rickety, 70, 399
 —, Sarcoma of, 121, 393
 —, Scrofulous Disease of, 65
 —, Syphilitic disease of, 78, 80
 —, Tubercle of, 60
 —, Tumours of, 393
Bosses, Cranial, 82
Bowel. (See INTESTINE.)
Bow-leg, 98
Brain, Compression of, 417
 —, Wound of, 418
Branchial cysts, 180
 — fistula, 180
Breast, Neuralgia of, 173
 —, Pigeon, 70, 101
Bronchus, Foreign body in, 240
Bubo, 107
Burns, 157
 —, Cicatrices after, 160
 — of larynx, 242
 —, Prognosis in, 158
 —, Treatment of, 158
Butcher's saw, 481
Buttock, Flattening of, 435
- Cæcitis, 349**
 —, Treatment of, 352
Calcaneum, Disease of, 502, 531
Calcaneus, Talipes, 520
Calculus in bladder, 300
 — in female, 312
 — in sacculus, 303
 — in ureter, 303
 — in urethra, 298
 —, Priapism from, 300
 —, Signs of, 300
 —, Sounding for, 301, 313
 —, Treatment of, by lithotomy, 304, 305
 —, by lithotripsy, 304, 311
 — under prepuce, 305

- Calvaria, Fracture of, 417
 Canal of Nuck, 367
 Cancrum oris, 197
 Cannula for tracheotomy, 45
 Capillary vascular tumour, 136
 Carbolic acid poisoning, Symptoms of, 465
 Caries of spine, 248, 252
 ———, High dorsal, 263
 ———, Mechanical treatment of, 262, 264
 ———, sicca of hip, 449
 ——— of spine, 250
 Carpo-pedal contractions, 169
 Carpus, Disease of, 496
 Cartilaginous tumour, 133
 Castration, 361
 Catarrhal laryngitis, 34
 Cautey in nævus, 138
 Central necrosis, 393
 ——— tumours of bone, 122, 393
 Cephal-hæmatoma, 178, 418
 ——— hydrocele, 418
 Cerebral meningocoele, 176
 Cervical abscess, 267, 272
 ——— collar, 262
 ——— glands, Enlarged, 103
 ———, vertebrae, Disease of, 254
 Chancre, 74
 Cheek, Fissure of, 188
 ———, Nævus of, 138
 ———, Noma of, 197
 Chest, Deformity of, 101, 380
 ———, Foreign body in, 156
 ———, Paracentesis of, 147
 ———, Fallacies in, 150
 Chilblains, 532
 ——— on heel, 535
 Child, injured, Examination of, 399
 Chloroform in tracheotomy, 41
 ———, Value of, 6
 Chronic abscess, To open, 268
 Cicatrix after burn, 160
 ———, Depressed, 120
 Circumcision, 288
 ———, Importance of, 285
 Clamp, Intestinal, 345
 Clavicle, Fracture of, 402
 Clearing tracheotomy wound, 47
 Cleft palate, 232
 ———, After-treatment of, 237
 ———, Age for operating, 233
 ———, Operation on, 238
 Clothing, Value of warm, 13
 Club foot, 510
 Club hand, 497
 Cod-liver oil, Inunction of, 64
 Coin swallowed, 216, 240
 Collar for neck disease, 262
 Collodion in nævus, 186
 Colon, Intussusception of, 337, 347
 Colotomy, 328
 Compare length of legs, To, 423
 Complications of spinal caries, 270
 Compound fracture, 416
 Compression of brain, 417
 Condition, Children out of, 6
 Condyles of femur, 86, 470
 Condylomata, 77, 83, 334
 Congenital asymmetry, 187
 ——— atrophy of limb, 125
 ——— cystic hygroma, 128, 190
 ——— dislocation of hip, 422
 ——— hernia, 366
 ——— hydrocele, 355
 ——— hypertrophy of limb, 125, 148
 ——— malformation of face, 175
 ——— nævi, 135
 ——— sacral tumour, 125, 247
 ——— syphilis, 75
 ——— tumours, 124
 Conservative surgery, 123, 394, 399
 Constipation, Obstinate, 326, 349
 Constriction of limb, 510
 Convalescence from diphtheria, 28
 Convalescents from diphtheria, 33
 Convulsions in otitis, 221
 Corneitis, Interstitial, 82
 Corrosive liquids swallowed, 242
 Cranial bosses, 22
 Cranio-tabes, 69, 81, 175
 Cranium, Fracture of, 417
 ———, Tumour of, 178, 418
 Cretinism, 173
 "Croup," 18
 ———, Associations of, 22
 ———, identity with laryngeal diphtheria, 14
 ——— is but a symptom, 18, 34
 ———, Spasmodic, 36
 Curvature of spine, Angular, 249
 ——— from weakness, 375, 385
 ———, Lateral, 375
 Cyphosis, 385
 Cystic hygroma, Congenital, 128, 190
 Cysts, Atheromatous, 189
 ———, Dentigerous, 191
 ———, Dermoid, 127, 202
 ———, of testis, 363
 ——— of lip, 202
 ——— of mouth, 191
 ——— of neck, 128, 180
 ——— of tongue, 202
 ———, Sebaceous, 131

- Dactylitis, Strumous, 65
 —, Syphilitic, 81
 Deafness, after mumps, 219
 — from enlarged tonsils, 206
 — from necrosis, 224
 — from syphilis, 83
 Defective growth after fracture, 410
 Deformities, Rickety, 86
 Deformity after spinal caries, 272
 — after paralysis, 167
 Dentigerous cysts, 191
 Depressed fracture, 417
 Dermatitis, Syphilitic, 76
 Dermoid cysts, 127, 202, 363
 Deviation of nasal septum, 211
 Diathesis, Hemorrhagic, 58

 Diet, Remarks upon, 12
 Diffuse otitis, 80
 Digits, Supernumerary, 509
 Dilatation of female urethra, 330
 Diphtheria, 14
 —, causes of, 15
 —, chronic, 17
 —, Diagnosis of, 19
 —, incubation of, 15
 —, Isolation in, 31
 —, Nasal, 27
 —, Prognosis in, 23
 —, Tracheotomy in, 26
 —, Treatment of, 24
 Diphtheritic inflammation of glands, 19
 — membrane, 20, 47
 — paralysis, 29
 — rash, 19
 Disinfectants in diphtheria, 33
 Dislocations, 421
 —, Congenital, of femur, 422
 — from hip-joint disease, 447
 Dorsal vertebrae, Caries of, 255
 — — —, Treatment of, 264
 Double hip disease, 449
 Douche, Nasal, 27, 214
 Drainage tube in empyema, 154
 — — — loose in chest, 156
 Dry caries, 250, 449
 Duchenne's paralysis, 167
 Dysphagia, 29, 216, 267
 Dyspnoea, 23, 239, 242
 Dysuria, 300

 Ear, Discharge from, 222
 —, external, Malformations of, 179
 —, Foreign body in, 220
 —, growths near, 179, 186
 Ear, Insects in, 221
 Eczema of thighs, Syphilitic, 76
 — of umbilicus, 274
 Elbow, ankylosis, 410
 —, Disease of, 468
 —, Dislocation of, 409, 421
 —, Excision of, 410, 492
 —, Fracture into, 406
 —, — near, 406
 —, — or dislocation, 408
 Electrolysis in naevi, 157
 Emaciation, 76
 Emetics in group, 25
 Empyema, 151
 —, Drainage in, 153
 —, Exploratory puncture in, 153
 —, Operation in, 152
 —, Resection of ribs in, 153, 156
 —, Spontaneous discharge, 152
 —, Symptoms of, 151
 —, Treatment of, 152
 Encephalocoele, 177
 Enchondroma, 133
 Encysted calculus, 302
 — hernia, 368
 — hydrocele, 358
 Enlarged glands, 103
 — tonsils, 205
 Enterotomy, 346
 Enuresis, 294, 300, 313, 319
 Epididymitis, 359
 Epiphyses, Union of, 407
 Epiphysis, Arrest of growth after injury of, 410
 —, Fracture through, 406. (*See special bone.*)
 —, Inflammation of, 78, 396
 —, Separation of, 79, 401
 Epiphysitis, 396
 —, Acute, 396
 —, Chronic, 78
 —, Syphilitic, 78
 Epispadias, 283
 Epistaxis, 58, 212
 — from hæmophilia, 58
 —, Treatment of, 212
 Epulis, 122, 180
 Erosion of joint, 474, 476
 Erythema, Surgical, 8
 Ethylate of sodium, 136
 Eustachian tube, 206
 Examination of patient, 1, 400
 Excision of ankle, 505
 — of elbow, 410, 492
 — of hip, 450
 — of knee, 479
 — of naevus, 139
 — of tonsil, 207
 Exfoliation, Syphilitic, 80

- Exhaustion in diphtheria, 23**
Exomphalos, 278
Exostosis, 184
Extension in joint disease, hip,
 knee, 437, 473
Extravasation in head injuries,
 178, 418
 — of urine, 290
Extroversion of bladder, 281
Eyelid, Nævus of, 137, 177
 —, Tumour of, 145

Face, Malformations of, 175
Facial paralysis, 224
Fæcal abscess, 275, 280
 — fistula, 274, 280, 330
Fæces, Impacted, 348
Fatigue in spine disease, 253
Fatty tumour, 133
Fauces, Inflammation of, 19
 —, Scald of, 242
Feeding-bottle, 13
 — in cleft palate, 225
 — in diphtheria, 52
Female, Stone in, 313
Femoral hernia, 374
Femur, Congenital dislocation of,
 422
 —, Fracture of, 413
 —, Malignant disease of, 121,
 383
 —, Necrosis of, 389, 393
 —, Osteotomy of, 93, 449
 — for genu valgum, 93
 — for stiff hip, 449
 —, Separation of epiphysis of,
 414
Feverishness, 8, 19
Fibrinous exudation in diphtheria,
 18, 20, 387
Fibroid tumour, 133
Fingers, Scabies on, 536
 —, Supernumerary, 509
 —, Webbed, 497
Fissure, Abdominal, 280
 —, Branchial, 180
 — of cheek, 188
 —, Orbital, 188
 —, Palatine, 232
Fistula, Fæcal, 274, 280
 — from spine disease, 252, 334
 — in ano, 252, 334
 — in neck, 180
 —, Penile, 284
 —, Perineal, 284, 330
 —, Umbilical, 274
 —, Urachal, 274
Fistula, Urethral, 284

Fistula, Urinary, 274
Flat foot, 288, 528
 —, Treatment of, 527
Fœtal inclination, 124
 — peritonitis, 277
 — rickets, 72
Fœtus, Attached, 124
 —, Syphilis of, 75
Fold of buttock, 435
Fontanelle, Nævus of, 137
Food for infants, 12
 — impacted in pharynx, 215
Foot, Deformities of, 509
 —, Diseases of, 529
 —, Inversion of, 511
 —, Perforating ulcer of, 536
Forced straightening in genu
 valgum, 91
 — in hip disease, 447
Forceps, Torsi-pressure, 43
Fore-arm, Fracture of, 412
Foreign body in air-passage, 238
 — in ear, 220
 — in gullet, 216
 — in nose, 213
 — in œsophagus, 216
 — in pleura, 156
 — in stomach, 217
Fracture, 399. (See special bone.)
 —, Badly set, 406
 —, Compound, 416
 —, Delayed union in, 404
 —, Forcible, 402
 —, Green-stick, 401
 —, Incomplete, 401
 —, Intra-uterine, 401
 —, Multiple, 401
 — near a joint, 406, 412
 —, Plaster of Paris in, 415
 —, re-fracture, 406, 411
 — through epiphysis, 406, 410
Frænum linguæ, Division of, 199
Fragilitas ossium, 401
Fresh air, Value of, 13
Fungus hæmatodes, 360
Funicular portion of peritoneum,
 355, 367
Furneaux Jordan's amputation,
 457
Furunculus, 144

Galvanism in paralysis, 166
Ganglion, 496
Gangrene, Juvenile, 535
 — of fingers, 535
 — of intestine, 345
 — of scrotum, 325
 —, Traumatic, 417

- Gangrenous stomatitis, 197
 Genito-urinary tract, Development of, 273
 Genu extorsum, 97
 —, valgum, 86
 —, Causes of, 87
 —, Treatment of, 89
 Glands, Enlargement of, 103
 — from diphtheria, 19
 — from sewer gas, 104
 —, Lymphatic, in sarcoma, 121
 —, Scrofulous, 61, 109
 —, Suppuration in, 111
 —, Treatment of, by electrolysis, 114
 —, —, by excision, 109
 —, —, by scraping, 116
 —, —, by thermo-puncture, 114
 Glossitis, 201
 Glottis, Oedema of, 242
 —, Scald of, 242
 Gluteal abscess, 252
 — fold, 435
 Gonorrhoea, 288, 324
 —, Differential diagnosis of, 324
 —, Treatment of, 324
 Grey milium granulations, 63
 Groin, Fulness in, 251, 445
 —, Pain in, 255, 350
 "Growing pains," 89, 255
 Guillotine for tonsil, 207
 Gullet, Foreign bodies in, 216
 Gum, Congenital hypertrophy of, 190
 —, Lancing the, 192
 —, Nævus of, 137, 191
 —, Spongy, 73, 197
 —, Tumours of, 122, 190
 Gummata, 80
 Gypsum bandages. (*See PLASTER OF PARIS.*)
- Hæmatoma, 178, 418
 Hæmaturia, 59, 300, 321
 Hæmophilia, 58, 192
 —, Treatment of, 60
 Hæmorrhage from umbilicus, 276
 — in lithotomy, 308
 — in tracheotomy, 43
 — recurring from bladder, 58, 321
 — from gums, 73, 193
 — from nose, 58, 212
 — from rectum, 58, 332
 —, Subperiosteal, 73
 Hæmorrhagic diathesis, 58
 —, Treatment of, 60
- Hairy mole, 141
 Hammer toe, 524
 Hand, Club, 467
 —, Deformities of, 467
 —, Diseases of, 465
 Hare-lip, Age for operation on, 226
 —, causation, 225
 —, Complicated, 225, 231
 —, Double, 230
 Head, Injuries to, 178, 417
 —, Pulsating tumour of, 418
 —, Tapping the, 175
 Headache, 221, 254, 258
 Health, Children out of, 6
 Heel, Sore, 535
 Hereditary syphilis, 75
 Hermaphroditism, 295
 Hernia, 363
 —, Cæcal, 367
 —, Causes of, 295, 364
 —, complicated with undescended testis, 371
 —, Congenital, 366
 —, Encysted, 367
 —, Femoral, 374
 —, Funicular, 367
 —, Hydrocele with, 366
 —, Infantile, 367
 —, Inguinal, 365, 373
 —, Lumbar, 270
 — of ovary, 354, 366
 — of testis, 360
 —, Radical "cure" of, 369
 —, reducible, Treatment of, 369
 —, Strangulated, 373
 —, Treatment of, 374
 —, Truss for, 364
 —, Umbilical, 278
 —, Adventitious, 280
 —, Strangulated, 280
 Herniotomy, 280, 373, 374
 Hiatus of bladder, 281
 High operation for lithotomy, 309
 Hilton's method of opening abscess, 115, 272
 Hip joint, Amputation at, 457
 —, Ankylosis of, 413, 418
 —, Congenital dislocation at, 422
 — disease, 426
 —, Abscess from, 445
 —, Attitude in, 430
 —, Causes of, 426
 —, Deformity in, 432
 —, Diagnosis of, 431
 —, Double, 449
 —, Excision in, 451
 —, Forcible straightening in, 447

- Hip-joint disease from paralysis
 165
 — from sacro-iliac disease, 459
 — from spinal caries, 434
 —, Mechanics of, 427
 —, Pain in, 429, 434, 436
 —, Paracentesis in, 445
 —, Signs of, 429
 —, Starting-point of, 427
 —, Termination of, 443
 —, Treatment of, 435
 Hodgkin's disease, 118
 Hollow foot, 520
 Hordeolum, 145
 Hot compresses in diphtheria, 25
 Humeral epiphysis, Upper, 404
 —, Lower, 407
 Humerus, Bending of, 99
 —, Fracture of, 403
 Hump in spinal disease, 253, 272
 Hunterian chancre, 74
 Hutchinson's teeth, 83
 Hydrocele, 358
 —, Congenital, 355
 —, Encysted, 358
 —, Funicular, 357
 —, Infantile, 357
 — of neck, 128, 180
 — of the canal of Nuck, 359
 — of the cord, 358
 — of tunica vaginalis, 358
 —, Treatment of, 356, 358
 Hydrocephalus, Acute, 66
 —, Chronic, 175
 Hydro-nephrosis, 314, 320
 Hydro-rachis, 244
 Hydro-thorax, 146
 Hygroma, Congenital cystic, 128, 180
 —, Pathology of, 129
 —, Treatment of, 130
 Hymen, Imperforate, 297
 Hypertrophy, Congenital, of limbs, 125, 143
 —, Nævoid, 143
 — of bone, 80
 — of clitoris, 296
 — of covering of spongy bone, 215
 — of glands, 103
 — of gums, 190
 — of lip, 201
 — of tongue, 200
 — of tonsils, 205
 —, Pseudo-muscular, 167
 Hypogastric lithotomy, 304, 309
 Hypospadias, 283, 295
 Hysterical affections, 168, 172
 — torticollis, 186
 Icti-puncture in nævus, 138
 Iliac abscess, 251, 259, 349, 350
 —, Diagnosis of, 259, 350
 Imperforate anus, 327
 — hymen, 297
 — mouth, 187
 — rectum, 326
 — urethra, 284, 294
 — vagina, 297
 Incision of joint, 445, 464
 Incontinence of urine, 300, 313, 320
 Indications for tracheotomy, 40
 Indolent ulcer, Scraping of, 66
 Inequality in girth of limbs, 462
 — in length of limbs, 423
 Infantile hernia, 367
 — hydrocele, 357
 — paralysis, 162, 523
 — peritonitis, 278
 — scurvy, 73
 — syphilis, 75
 Infants, Acute arthritis of, 396
 —, How to bring up, 12
 —, Overlaying of, 37
 —, Tetanus in, 36, 169
 Injured child, Examination of, 399
 Inflammation, Diphtheritic 20, 21
 — of bone, 80, 392
 — of ear, 221
 — of joints. (See special joint.)
 — of larynx, 34, 36
 — of parotid gland, 217
 — of periosteum, 387
 — of peritoneum, 277, 351
 — of prepuce, 288
 — of skin, 76
 — of testis, 359
 — of tonsils, 204
 — of urethra, 288
 — of vagina, 324
 Inflation in obstruction, 340
 Inguinal hernia, 366. (See HERNIA.)
 Injection in nævi, 140
 — in spina bifida, 246
 — of meningocele, 179
 Insects in ear, 221
 Inspection of throat, 19
 Intermaxillary bone in hare-lip, 231
 Interstitial keratitis, 82

- Intestinal obstruction, Acute, 335**
 ———, Causes of, 336
 ———, Chronic, 347
 ———, Treatment of, 339
Intestine, Congenital malformation of, 326
 ———, Gangrene of, 345
Intracranial cyst, 131
Intrathoracic tumour, 147
Intra-uterine fracture, 401
Intubation of larynx, 27
Intussusception, 337, 344
Inunction of oil, 64
Invagination of rectum, 331
Inversion of foot, 511
Iodine injection in spina bifida, 246
Iodoform poisoning, 10
Irreducible hernia, 279, 373
Irritable bladder, 300, 313
Ischio-rectal abscess, 252, 333
Isolation in sore-throat, 19, 33
- Jaw, Development of, 187, 232**
 ———, Lower, in rickets, 70
 ———, Necrosis of, 195
 ———, Tumours of, 122, 190
Joints. (See special joint.)
 ———, Erosion of, 476
 ———, Fracture into elbow, 406
 ———, Secondary disease of, 399
 ———, Stiff, 410, 412
 ———, When recovered, 443, 473
Jordan's amputation, 457
Jury-mast in cervical caries, 262
- Keloid growths, 145**
Keratitis, Interstitial, 82
Kidneys, Disease of, 283, 451
Knee joint, Ankylosis of, 470
 ———, Arthroctomy, 476
 ———, Atrophy of leg, 469
 ———, Deformity in, 470
 ———, Disease of, 461
 ———, Amputation for, 484
 ———, Displacement at, 470
 ———, Excision of, 479
 ———, Fractures about, 414
 ———, Pain in, in hip disease, 429
 ———, Suppuration in, 464
 ———, synovitis in, Acute, 462
 ———, Chronic, 468
 ———, Pains about, 255, 350
 ———, Weak, 101
Knock-knee, 86
Kyphosis, 385
- Lameness, 522**
Lancing the gums, 169, 192
Laparotomy, 341
Laryngismus stridulus, 36, 170
Larynx, Acute inflammation of, 84
 ———, Burn of, 242
 ———, Chronic inflammation of, 36
 ———, Foreign body in, 56, 238
 ———, Papillomata in, 56
 ———, Scald of, 242
Lateral curvature of spine, 375
Leaving off Thomas's splint, 443
Leeches, 10
Leg, Bowed, 97, 98
 ———, Deformities of, 86
 ———, Fracture of, 399, 415
Legs, Length of, 423
 ———, Pains in, 255, 429, 434
Ligature in nœvus, 140
Limb, Annular constriction of, 510
 ———, Hypertrophy of, 143
Lines alba, 71
Lip, Congenital malformation of, 201
 ———, Disease of, 194
 ———, Nœvus of, 137, 141, 191
Lipoma, 133
Lithotomy, 304
 ———, Fallacies in, 307
 ———, Lateral, 304
 ———, Median, 311
 ———, Preparation of patient, 304
 ———, Suprapubic, 309
 ———, Urethral, 298
Lithotripsy in boys, 304, 311
 ——— in girls, 312
Littre's operation, 328
Lock-jaw, 173
Loins, Arched, 168, 253, 423, 431
 ———, Stiff, 252
Lordosis, 167, 253, 431
Lumbago, 255
Lumbar colotomy, 329
 ——— hernia, 270
 ——— spinal disease, 257
Lund's wool truss, 365
Luschka's gland, 126
Lymphadenoma, 118
Lymphatic abscess, 114
 ——— glands, Enlargement of, 103
 ——— in axilla, 107
 ——— in groin, 107
 ——— in neck, 103
 ——— nœvus, 143
Lymphoma, 117
- Macrocheilia, 201**
Macroglossia, 200

- Macrostoma, 188
 Malformation. (See special part.)
 Mamma, Pains in, 173
 Massage in wry neck, 183
 Mastodynia, 173
 Mastoid gland, 115
 Masturbation, 287
 Maxilla. (See JAW)
 Measuring, 423, 447, 462
 Meatus auditorius. (See EAR.)
 ——— urinaris, Small, 294
 Meckel's diverticulum, 275
 Medicine, Administration of, 9
 Medulla of bone, Scraping, 395
 Medullary tumours of bone, 122
 Membrane, Diphtheritic, 20
 ———, Solvents for, 55
 Meningitis, Tubercular, 66
 Meningocele, 177, 178, 215
 ———, Frontal, 177
 ———, Occipital, 176
 ———, Spinal, 243
 Mercurial teeth, 84
 Mercuric absorption, 271
 Metacarpal bones, Fracture of, 413
 Metatarsus, Disease of, 532
 Microstoma, 187
 Micturition, Frequent, 313, 319
 Milk, Artificial human, 12
 Mole, Hairy, 141
 Molluscum contagiosum, 144
 Monk's-hood prepuce, 284
 Mortification. (See GANGRENE.)
 Morton's injection, 246
 Mouth, Development of, 187
 ———, Hygroma of, 128, 190
 ———, Inflammation of, 194
 ———, Large, 188
 ———, Nævus of, 191, 202
 ———, Small, 187
 Mucous patches, 77
 Mumps, 217
 Myeloid sarcoma, 122
 Myxœdema, 173
- Nævus, 135
 ———, Arterial, 141
 ———, Capillary, 136
 ———, Excision of, 139
 ———, Hairy, 141
 ———, in cheek, 188
 ———, in eyelid, 137, 177
 ———, in lip, 137, 141, 191
 ———, in mouth, 137, 191, 202
 ———, Lymphatic, 143
 ———, of rectum, 137, 334
- Nævus over fontanelle, 137
 Nasal bones, Disease of, 77
 ——— diphtheria, 27
 ——— septum, Deviation of, 211
 Naso-pharynx, Disease of, 209
 Natiform skull, 82
 Neck, Abscess of, 267, 272
 ———, Cicatrix of, 109, 161
 ———, Development of, 180
 ———, Enlarged glands in, 103
 ———, Fistulæ in, 180
 ———, Hydrocele of, 128, 180
 ———, Hygroma of, 128
 ———, Pains in, 185, 254
 ———, Stiff, 186
 ——— vertebra, Disease of, 254
 ———, Wry, 181
 Necrosis, Acute, 388
 ———, Central, 393
 ——— of jaw, 195, 197
 ——— of palate, 197
 ——— of temporal bone, 224
 Nélaton's line, 423
 Nephritis from urinary obstruction, 283
 Neuralgia in breast, 173, 386
 ——— in spine, 172
 Neuro-mimesis in spine, 172, 386
 Nitric acid in nævus, 136
 Nodes, 81
 Nodules in Rheumatism, 133
 Noma of mouth, 197
 ——— of scrotum, 325
 ——— of vulva, 325
 Non-union of fracture, 404
 Nose, Abscess of, 212
 ———, Bleeding from, 212
 ———, Discharge from, 77, 214
 ———, Foreign body in, 213
 ———, Meningocele in, 177, 215
 ———, Polypus of, 212
 ———, Syphilitic disease of, 77
 Notched teeth, 83
 Nuck, Canal of, 337
- Obstruction of air passages, 23, 239, 242
 ——— of gullet, 216, 267
 ——— of intestine, 335
 ——— of urethra, 298
 Occipital pains, 254, 258
 Occlusion of meatus urinaris, 294
 ——— of vagina, 297
 Edema of glottis, 242
 ——— of scrotum, 299
 Oesophagus, Foreign body in, 216
 Onanism, 287
 Opening abscesses, 115, 268

- Operations, 4, 6
 —, Anæsthetics in, 6
 —, Precautions in, 4
 Opium, Value of, 9
 Orbital fissure, 188
 Orchitis, 359
 — after mumps, 219
 Orthopædics. (*See* special sub-
 ject.)
 Os calcis, Disease of, 531
 Osseous ankylosis. (*See* special
 joint.)
 Osteitis, Acute, 392
 —, Diffuse, 80
 Osteo-mylitis, 342
 —, Chronic, 395
 Osteophytes, 87, 134
 Osteotomist, Advice to, 92
 —, Caution to, 93
 Osteotomy for genu valgum, 94,
 96
 — in hip ankylosis, 449
 — of tibia, 96, 101
 Otitis, 221
 Otorrhœa, 221
 —, Prognosis in, 223
 Ovariectomy, 127
 Ovary, Diseases of, 127
 —, Hernia of, 354
 Ozæna, 214
- Pains in abdomen, 254, 335
 — in arms, 255
 — in chest, 255, 263
 — in groins, 255, 350
 — in head, 254
 — in knee, 255, 429, 458
 — in legs, 255, 260, 526
 — in mamma, 173
 — in neck, 254, 255, 258
 — in penis, 301
 — in scalp, 255, 258
 — in shoulders, 255
 — in thighs, 255, 429
 Palate, Cleft, 232
 —, Fissure of soft, 234
 —, Perforation of, syphilitic, 80
 Papillary growths in larynx, 56
 Paracentesis of hip joint, 445
 — of oracis, 147
 Paralysis, 162, 270
 —, Diagnosis of, 165
 —, Diphtheritic, 29
 —, Facial, 224
 —, Infantile, 162
 — in spinal caries, 270
 —, Pseudo, 79
 —, Pseudo-hypertrophic, 167
- Paralysis, Spastic, 170
 —, Treatment of, 166
 Paralytic contractions, 170, 523
 — talipes, 523
 Paraphimosis, 293
 Paraplegia, 170, 270
 Parietal bone, Absence of, 420
 Parotid gland, 217
 Parrot's nodes, 82
 Patella, Dislocation of, 426
 Patten, 442
 Pediculi capitis, 106
 Pelvic abscess, 251, 446, 351
 Pemphigus, 76
 Pendulous growths near ear, 179
 Penile fistula, 284
 Penis, Adhesion of, to scrotum,
 284
 —, Edema of, 294, 299
 —, Pain in, 301
 Perforating ulcer of foot, 536
 Perforation of palate, 80
 Perichondrosis, 78
 Perineal fistula, 284
 Perioritis, Acute, 387
 —, Chronic, 80, 394
 — mistaken for "rheumatism,"
 387
 —, Symptoms of, 389
 —, syphilitic, 80
 —, Treatment of, 390
 Peritonitis, 278, 351
 —, Infantile, 277
 —, Traumatic, 278
 Perityphlitis, 349
 Perlèche, 194
 Pes cavus, 520
 — gigas, 143, 519
 — planus, 526
 Petticoat tube, 303
 Phalanx of thumb, Dislocated,
 422
 Pharynx, Abscess behind, 257, 267
 —, Foreign body in, 216
 —, Ulceration of, 209
 Phimosis, 285, 314
 —, Circumcision in, 288
 —, Dilatation in, 286
 —, Dorsal incision in, 292
 Phthisis in joint disease, 61, 66,
 475
 Physiological treatment of ob-
 struction, 339
 Pigeon-breast, 70, 101
 Plaster of Paris in club foot,
 513
 — in fracture, 409
 — in joint disease, 463
 — in spinal disease, 262, 264

Pleura, Fluid in, 146
 —, Tapping the, 147
 Polypus of bladder, 322
 — of nose, 117, 215
 — of rectum, 332
 — of umbilicus, 274
 — of urethra, 320
 Popliteal abscess, 108
 Port-wine stains, 142
 Post-auricular abscess, 224
 — pharyngeal abscess, 209, 257,
 267
 Pott's disease of spine, 249
 Poultices, 10
 Prepuce, Hooded, 234
 —, Long, 292, 314
 —, Tight, 285
 Pressure over nævi, 137, 161
 — sores, 7
 Priapism, 300
 Prolapse of rectum, 379, 331
 Proliferous cysts, 127, 363
 Pruritus vulvæ, 312, 320, 324
 Pseudo-hypertrophic paralysis,
 167
 — paralysis, Syphilitic, 79
 Psosa abscess, Differential diag-
 nosis of, 251, 259
 —, Double, 272
 —, Treatment of, 266, 263
 Pulsating tumour of scalp, 418
 Pulse, 4
 Puncture of brain, 175
 — of thorax, 147
 Purulent absorption, 391, 396
 Pyæmia, 8, 277, 388, 396

 Quinsy, 204

 Rachitis, 68
 Radical cure of hernia, 369
 — of hydrocele, 358
 Radius, Dislocation of, 421
 —, Congenital, 425
 —, Fracture of, 412
 Ranula, 189, 191
 Rash, in diphtheria, 19
 Raynaud's disease, 535
 Rectum, 326
 —, Imperforate, 326
 —, Invagination of, 330
 —, Nævus of, 334
 —, Polypus of, 332
 —, Prolapse of, 331
 Redressement forcé, 91
 Reducible hernia. (See HERNIA)
 Refracture of bones, 436, 411
 Resection. (See EXCISION.)

Resection of ribs, 153, 156
 Residual abscess, 250
 Respiration, Artificial, 38, 48
 Rest in hip disease, 435
 — in spine disease, 261
 Retained testis, 353
 Retention of urine, 298
 Retraction of prepuce, 235
 Retro-pharyngeal abscess, 257, 267
 Rheumatic nodules, 133
 "Rheumatism," 255, 258, 397, 523
 Ribs, Resection of, 153, 156
 Rickets, 63
 —, Causes of, 68
 —, Cranio-tabes in, 69
 —, Deformities of, 86
 —, Fœtal, 72
 — in adolescents, 72
 —, Late, 72
 —, Spinal curvature in, 375, 335
 —, Symptoms of, 68
 —, Treatment of, 72
 — with scurvy, 73
 Rugous bladder, 321
 Rupture. (See HERNIA.)

Sac of hernia, 366
 — in radical cure, 370
 Sacculated bladder, 302
 Sacral tumour, Congenital, 125,
 247
 Sacro-iliac disease, 458
 —, Differential diagno-
 sis of, 430, 459
 —, Prognosis in, 461
 —, Treatment of, 459
 Sarcoma, 122, 192, 393
 Scabies, 536
 Scald, 157
 — of throat, 242
 Scalp, Blood tumour of, 178, 420
 —, Nævus of, 137
 Scar following burn, 160
 Scarlet fever, "Surgical," 8
 "Sci-sor-legs," 450
 Scoliosis, 375
 Scott's dressing, 473
 Scraping indolent sores, 66
 — out gland capsule, 116
 — out medulla of bone, 395
 Scrofula, Nature of, 60
 —, Treatment of, 63
 Scrofulo-derma, 65
 Scrofulous arthritis, 61, 468
 — disease of glands, 61, 109
 — ulceration, 66
 Scrotum, Adhesion of penis to, 234
 —, Edema of, 299

- Scrotum, Malformation of, 295
 —, Noma of, 325
 Scurvy-rickets, 73
 Sebaceous tumours, 131
 — of eyelids, 145
 Secondary syphilis, 75
 Separation of epiphysis, 79, 404, 414
 Septicæmia, 389
 Septum of nose, 211
 —, Abscess of, 212
 —, Deviation of, 211
 Sequestrum, 269, 327, 393
 Serous fistula, 180
 Sewer gas, 104
 Sex, Mistaken, 295
 Shortening from hip disease, 448
 Shoulder, 448
 —, Excision of, 488
 —, Fracture near, 404
 — growing out, 378, 386
 Skin, Syphilitic affection of, 76
 Skull, Fracture of, 417
 Snuffles, 77, 124
 Soft cancer, 121
 Sore throat, 19, 208, 209
 Sound, 302
 Sounding for stone in boys, 301
 — in girls, 313
 Spanton's method, 373
 Spasmodic croup, 36, 170
 Spastic paraplegia, 170
 Spermatic cord, Hydrocele of, 357
 Spina bifida, 246
 —, False, 125, 247
 —, occulta, 248
 Spinal abscess, Treatment of, 266, 271
 — cord, Disease of, 162, 270
 — supports, 262, 381
 Spine, Abscess in, 250, 259
 —, Angular curvature of, 248
 —, Caries of, 249
 —, Cervical, 254, 257
 —, Complicated with joint disease, 249, 271
 —, Diagnosis of, 252
 —, Dorsal, 255
 —, Lumbar, 255
 —, Paralysis from, 270
 —, Prognosis of, 253
 —, Symptoms of, 253
 —, Treatment of, 261, 264
 —, Hysterical, 172, 386
 —, Lateral curvature of, 375
 —, Result of, 379
 —, Treatment of, 381
 Splay foot, 526
 — in paralysis, 523
 Splint, Thomas's, for hip, 439, 442
 Splint, Thomas's, for knee, 471
 Spongy gums, 73
 Sprain of ankle, 499
 Staff for lithotomy, 304
 Staphylophary, 233
 Sterno-mastoid contraction, 181, 186
 — tumour, 181
 Sternum, Bowing of, 103
 Stiff back, 252
 — hip, 452
 — neck, 186, 252
 Stimulants in diphtheria, 53
 Stirrup and weight, 437, 473
 Stomatitis, Follicular, 194
 —, Gangrenous, 197
 —, Strumous, 195
 —, Ulcerative, 194
 Stone in bladder, 300. (*See CALCULUS.*)
 — in ureter, 303
 — in urethra, 298
 Straightening in hip-joint disease, 447
 — of valgus knee, 91
 Strain, 499
 Strangulated hernia, 373
 Struma, 60
 —, a scapegoat, 104
 —, Prognosis in, 63
 Strumous dactylitis, 65
 — tubercles, 64
 Styte, 145
 Subcutaneous nævus, 139
 Submaxillary abscess, 103
 Suboccipital disease, 257
 Subperiosteal abscess, 388
 — hæmorrhage, 73
 — tumours, 122, 393
 Sucking tracheal wound, 47
 Sulphuric acid in joint disease, 475
 Sunshine, Value of, 11
 Supernumerary fingers, 509
 — toes, 509
 Suppuration. (*See ABSCESS.*)
 Suprapubic lithotomy, 309
 "Surgical" scarlet fever, 8
 Swallowing tongue, 209
 Syme's amputation, 516
 Synostosis of hip, 449
 Synovial membrane, Disease of, 463
 Synovitis, 396, 462
 —, Pyæmic, 396, 461
 Syphilides, 76
 Syphilis, 74
 — from vaccination, 11, 75
 — (gummata), 80
 —, Infantile, 75

- Syphilis of bone, 80
 — of nasal membrane, 77
 —, Primary, 74
 —, Suspected, 79
 —, Treatment of, 84
 Syphilitic corneitis, 82
 — joints, 83
 — necrosis, 80, 393
 — nodes, 82
 — paralysis, 79
 — perichondrosis, 78
 — separation of epiphyses, 79
 — teeth, 83
- Talipes, 510
 —, Causation of, 510
 —, Paralytic, 523
 —, Treatment of, 523
 —, Valgus, 523, 526
- Tapping abscesses, 266
 — hydrocele, 357
 — the chest, 147
 — the joints, 445
- Tarsus, Disease of, 529
 —, Partial excision of, 519, 531
- Teeth, Decayed, 105
 —, Mercurial, 84
 —, Syphilitic, 83
- Temperature, 2
- Temporal bone, Necrosis of, 224
- Tendo Achilles, Division of, 514
 —, splicing, 520
- Tenotomy in club foot, 514
 — in hip disease, 447
 — in knock-knee, 92
 — in paralytic deformity, 524
 — in wry neck, 183
- Testis, 353
 —, Descent of, 353
 —, Fœtal remains in, 127, 363
 —, Implicated in mumps, 219
 —, Malignant disease of, 354
 —, Malposition of, 354
 —, Removal of, 361
 —, Strumous, 360
 —, Transplantation of, 354
 —, Tumours of, 361, 363
 —, Undescended, 353
- Tetanus, 36, 169, 173
- Tetany, 169
- Thermo-cautery in nævus, 138
 — in tracheotomy, 45
- Thermometer, Value of, 2
- Thigh, Amputation of, 457, 475, 484
- Thomas's splint for hip, 439
 — for knee, 471
- Thoracis, Paracentesis, 147
- Throat. (*See* LARYNX.)
- Throat cough, 209
 —, Sore, 19, 208, 209
- Thrombosis of umbilical vein, 277
- Thrush, 194
- Thumb, Phalanx dislocated, 422
 — -sucking, 200
- Thyrotomy, 57
- Tibia, Dislocation of, 425
 —, Fracture of, 415
 —, Osteotomy of, 96, 97
- Toe, Hammer-, 524
- Toes, Deformity of, 509
 —, Scabies on, 536
 —, Supernumerary, 509
 —, Webbed, 509
- Tongue, Bite of, 203
 —, Cysts in, 202
 —, Diseases of, 199
 —, Examination of, 3
 —, Hypertrophy of, 203
 —, Nævus of, 202
 —, Swallowing, 200
 —, Ulcer beneath, 202
- Tongue-tie, 199
- Tonsil guillotine, 207
- Tonsils, Amputation of, 207
 —, Hypertrophy of, 205
 —, Inflammation of, 204
 —, —, tubercular, 209
- Tooth extraction, Bleeding after, 193
- Torticollis, 185, 186
 —, Hysterical, 186
- Trachea, Foreign body in, 240
 —, Operation on, 39
- Tracheal wound dilator, 44
 — —, Sucking, 47
- Tracheocele, 181
- Tracheotomes, 50
- Tracheotomy, 39, 42
 —, After-treatment of, 52
 —, Anæsthetics in, 41
 —, Appreciation of, 39
 —, Cellulitis after, 55
 —, Fallacies in, 49
 —, for foreign bodies, 241
 —, Importance of early performance of, 41
 — in croup, 36
 — in diphtheria, 39
 —, Indications for, 26, 40
 —, Instruments needed in, 41
 —, Landmarks in, 42
 —, Prognosis after, 50
 —, Thermo-cautery for, 45
 —, Tube for, 45, 54
 — —, Clearing, 53
 — —, Tying in, 46

Traumatic cephal-hydrocele, 178,
418

— gangrene, 417

Trephining, 419

Trismus nascentium, 173

Trochar for tapping chest, 147

Truss, Worsted, 365

Trusses, 364

Tubage of larynx, 27

Tube, Removal of, 55

—, Tracheotomy, 39

—, Trochanter, 452

Tuberculosis, 60

—, Meningitis in, 66

Tumid abdomen, 71

Tumours, 121

—, Congenital, 124

—, —, Cystic, 127, 128

—, —, Sacral, 125

—, Encysted, 128

—, Fatty, 133

—, Fibroid, 133

—, Malignant, 121

— of bone, 134

— of cartilage, 133

— of scalp, 418

—, sarcoma, 121

—, Sebaceous, 133

Tunica vaginalis. (See HERNIA,
HYDROCELE.)

Twins, Joined, 124

Ulcer, Perforating, of foot, 533

Ulceration beneath tongue, 202

— of throat, 19

—, Strumous, 66

—, Tubercular, of tonsil, 209

Ulna, Fracture of, 412

Umbilical hernia, 278

— vein, Thrombosis of, 277

Umbilicus, Eczema at, 274

—, Hemorrhage at, 276

—, Polypus at, 274

—, Suppuration at, 276, 277

—, Urinary fistula at, 274

Union of fracture delayed, 401

Urachal fistula, 274

Ureter, Calculus in, 303

—, Dilatation of, 314

Urethra, Calculus in, 298

—, Dilatation of orifice of, 294

—, Fistula of, 284

—, Occlusion of, 284, 294

—, Rupture, 299

Urethral lithotomy, 298

Urine, Albumen in, 5, 22, 451

—, Blood in, 59, 321

—, Extravasation of, 299

— in carbolic poisoning, 465

—, Incontinence of, 300, 313

—, —, in girls, 312, 319

—, Retention of, 298

Uvula, Elongation of, 209

Vaccination, 11

— of nævi, 149

—, Syphilis from, 75

Vagina, Atresia of, 297

—, Discharge from, 324

—, Imperforate, 297

Valgus. (See TALIPES.)

Vascular urethral growth, 320

Vegetations in larynx, 56

— in pharynx, 210

Veins, Air in, 184

Venous nævi, 135

Ventral hernia, 278

Vermiform appendix, 349

Verruæ, 143

Vertebrae. (See SPINE.)

Vesicæ, Hiatus, 281

Vulva, Noma of, 325

—, Pruritus of, 323

Vulvitis, 323

—, Aphthous, 325

Warts, 143

— on tongue, 203

Warty growth at umbilicus, 274

Wasting of limb, 163, 412

Water on the brain, 66, 175

Weak ankles, 525

— knees, 101

Webbed fingers, 497

— toes, 509

Weight and pulley, 437, 473

Wens, 131

White swelling, 468

Whooping cough, Ulceration of
tongue in, 202

Wind-pipe, Foreign body in, 238
(See LARYNX and TRACHEA.)

Wound, Sucking tracheal, 47

Wrist, Disease of, 495

Wry neck, 181, 185, 186

—, Causes of, 181

— from cervical caries, 185

— Treatment of, 182



